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Metropolitan Job Loss In The Great Recession: Where Did Those Who Lost Jobs Reside?

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METROPOLITAN JOB LOSS IN THE GREAT RECESSION: WHERE DID THOSE
WHO LOST JOBS RESIDE?

by

Peter Jonathan Brandt

Bachelor of Science (Honors), Brandon University, 2016

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

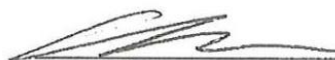
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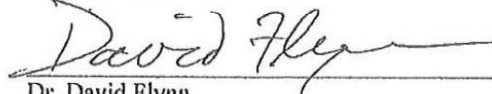
This thesis, submitted by Peter Brandt in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.



Dr. Michael Niedzielski, Chairperson

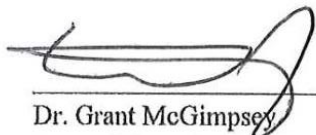


Dr. Enru Wang



Dr. David Flynn

This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.



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Peter Jonathan Brandt
May 3, 2018

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ABSTRACT

The Great Recession was one of the worst economic downturns in recent history. Lasting approximately from 2007 to 2009, locations faced economic hardships of varying length and severity at regional, metropolitan, and neighborhood scales. Scholars have assessed the geographies of job loss during the recession in a variety of contexts, typically from the workplace perspective. However, the impact of job loss at a workplace location also reaches to the different home locations of the employees who lost jobs. Therefore, the purpose of this paper is to compare the loss of jobs during the recession, from the perspective of where those who lost jobs resided, and the recovery in years following between and within a sample of ten cities in the United States. This was accomplished by tracking changes in the number of employed residents per census block group between 2007, 2009, 2012, and 2015 across ten metropolitan areas. The change between 2007 and 2009 provided a picture of the immediate impact of the recession, while 2012 and 2015 showed the short-term and long-term recoveries. Employment trends were analyzed for the general population, and broken down by a number of socioeconomic characteristics including age, income, and job sector. The results of the analysis revealed both geospatial and socioeconomic patterns of employment change, contributing to a better understanding of the effects of the Great Recession.

CHAPTER I

INTRODUCTION

The Great Recession was a near global economic downturn during the late 2000s and early 2010s. The recession had far-reaching negative effects, and economists determined it to be the worst recession since World War II (Elsby, Hobjin, and Sahin 2010; Karahan and Rhee 2013). Job losses, mortgage defaults, and home foreclosures all spiked, forcing people to cope with new economic realities facing them.

The effects of the Great Recession were not experienced equally. The United States was one of many nations severely affected, although there was significant variation at a sub-national level (Aalbers 2009; Hall, Crowder, and Spring 2015). Differences are evident at regional, metropolitan, and neighborhood levels thanks to the spatial dependence of the labor market and real estate (Aalbers 2009; Fogli, Hill, and Perri 2012). Consequently, the recession varied in timing, severity, and duration between areas due to their differing pre-recession economic states (Clayton 2011). For example, many of the American cities that experienced the deepest, longest recessions were found in the Sunbelt states of California, Nevada, Arizona, and Florida (Lucy 2010; Arias, Gascon, and Rapach 2016), thanks in part to the unsustainable housing boom in years prior (Gabe and Florida 2013). Variation also existed within metropolitan areas, as city centers, suburbs, and exurbs within individual metropolitan areas were impacted differently by the recession (Immergluck 2010; Lucy 2010; Kneebone 2013; Anacker 2015).

Furthermore, the impact of the recession within an area differed because of a variety of socioeconomic characteristics. Significant differences have been found when considering race and ethnicity (Bocian, Li, and Ernst 2010; Hall, Crowder, and Spring 2015), education level (Arias, Gascon, and Rapach 2016), and industry and wage (Kuehn 2011; Gabe and Florida 2013; Kneebone 2013). These are important distinctions to make, as certain groups may be more vulnerable to the negative effects of an economic downturn.

Job loss was one major result of the Great Recession, with unemployment climbing from a low of 4.4% in May 2007 to a high of 10.0% in October 2009. The causes and consequences of this rapid job decline have been the topic of many studies. As jobs and workers are tied to specific locations, it is important to consider the geography of job loss. Previous research has incorporated this by determining the change in the number of jobs in an area or the number that are accessible within a certain travel time (Kneebone and Holmes 2015). These approaches measure job change at the work location rather than the location of the worker, focusing on where jobs were lost or gained. While this type of analysis provides valuable insight, it neglects the worker. If a large number of jobs are lost in a certain area, the effects are not limited to that area as workers that lost those jobs may reside in any number of surrounding neighborhoods. It has been determined where jobs were lost but what is missing from the discussion is where the people who lost those jobs resided.

Regardless of the length or severity of the recession in different areas, a period of recovery followed where jobs were replenished. Again, there is variation by location,

with some labor markets recovering more quickly while others still have yet to recover to their pre-recession levels (Clayton 2011). Therefore, it is important to include the recovery period in order to gain an idea of not only how areas were differentially affected by the recession but also how they responded to those impacts in the years following.

Quantifying job loss and recovery within and between areas is an important topic on its own, but consideration for the makeup of the residents of areas where jobs were lost may provide perspective on the socioeconomic variation in job loss. It has been established that the effects of the recession were not experienced equally by different demographics and job sectors (Kuehn 2011; Hall, Crowder, and Spring 2015). Furthermore, certain groups of people, such as those with a low wage job or with a lower level of education, may find it more difficult to respond to or weather any negative impacts they experience. It may be beneficial then to consider the vulnerability of local populations given their socioeconomic characteristics when assessing spatial patterns of job loss.

Considering the spatially varied effects of the Great Recession, the purpose of this paper is to compare the loss of jobs during the recession, from the perspective of where those who lost jobs resided, and the recovery in years following between and within a sample of ten cities in the United States. This was accomplished by tracking changes in the number of employed residents per census block group between 2007, 2009, 2012, and 2015 across ten metropolitan areas. Employment trends were analyzed for the general population, and broken down by a number of socioeconomic characteristics including

age, income, and job sector, revealing both geospatial and socioeconomic patterns of employment change.

This research topic is significant because it provides new perspectives on the topic of job loss during the Great Recession. Job loss and other impacts of the recession vary between locations, and from a national scale to a neighborhood one. Most studies of the recession only consider effects down to the metropolitan area or county scale, likely due to the nature of their data. However, significant variation exists within each metropolitan area and county, which can be captured using data at a finer spatial resolution.

The number of jobs lost during the recession has been the subject of a number of studies. Unlike previous studies though, this study will utilize the locations where workers reside instead of their workplace locations. This provides a unique perspective and emphasizes the residential and neighborhood impacts of job loss.

Lastly, it is important to include the recovery when studying the recession as it provides a more complete picture of the impact that the recession had on an area. Assessing longer-term recovery between and within a number of cities would provide greater discernment of which areas recovered most successfully. Different aspects of recovery from the recession have been studied previously, but in the rare cases where they are addressed from a geographic perspective, the workplace location is used or the unit of study is entire metropolitan areas (Shearer et al. 2018). Using the home location of employees and a smaller areal unit of study enables better insight into localized patterns of employment recovery following the recession.

CHAPTER II
LITERATURE REVIEW
The Great Recession

Background

Following an extended period of growth, economies around the world took a turn for the worst in 2007. The economic downturn would prove to be the deepest and longest recession since before World War II. Coined the “Great Recession”, few places on the globe escaped its effects, although the impacts were far from even. The United States and Europe bore the brunt of the recession, with American cities being hit the hardest while European cities had some of the longest recoveries (Berube et al. 2010).

According to the National Bureau of Economic Research, the recession officially lasted from December 2007 to June 2009 in the United States. However, the story of the recession is not contained within these dates. The effects of the recession were also felt for years after and in some places are still being felt (Clayton 2011). For example, the labor market has seen a painfully slow recovery, with unemployment yet to return to pre-recession levels (Farber 2012; Rothstein 2014). Conversely, there were economic forces at work years before that would contribute to the recession and its severity. This includes poor regulation of the financial sector, which allowed subprime lending to flourish and contributed to a growing housing bubble that would come crashing down (Bocian, Li, and Ernst 2010, Lucy 2010).

Housing Crisis

While this project focusses on job loss during the Great Recession, the importance of the housing crisis as a contributing factor to the recession, and specifically unemployment, necessitates that it be addressed. There was enormous investment in homeownership pre-recession (Anacker 2015). The rate of home ownership in the United States grew from 64% in the 1960s to 66% in the 1990s, and Presidents Bill Clinton and George H.W. Bush pushed for further homeownership increase (Lucy 2010). In order to accomplish this there was a need to draw more people into home ownership, specifically low and moderate income and minority households, which had the lowest rates of homeownership (ibid). Easy credit was the path to homeownership for these groups, and it was successful in increasing homeownership rates. However this credit often came with unfavorable borrowing options, so while subprime lending allowed people who previously could not afford a home to purchase one, it ended up causing unequal fallout when the housing bubble burst (Williams, Nesiba, and McConnell 2005).

Widespread residential development occurred in the early 2000s, particularly in the suburbs and exurbs of Sunbelt cities (Gabe and Florida 2013). This produced rapid economic growth and an employment boost, especially in sectors like construction. However, it created an unsustainable economy driven by housing development and facilitated by subprime lending (ibid). People were purchasing homes they could not afford. Between 2000 and 2007, the ratio of house value to median family income grew from 2.4 to 3.2 (Lucy 2010). This was made possible through easy credit and the prospect of home values appreciating. When housing prices began contracting, about the same

time as the onset of the recession and a spike in unemployment, the foreclosure rate skyrocketed (Bocian, Li, and Ernst 2010; Hall, Crowder, and Spring 2015).

Foreclosures had increased previously in economically struggling manufacturing centers, however the increase in foreclosures concurrent with the onset of the recession was driven by inflated housing prices caused by rapid growth (Aalbers 2009; Immergluck 2010). As the number of foreclosed properties accumulated, it became a national crisis. However, the crisis of foreclosures varied in timing and length by region (Hall, Crowder, and Spring 2015). The foreclosure crisis was the worst in the Sunbelt, which had seen rapid growth during the subprime boom, with California, Arizona, Nevada and Florida making up 62% of all foreclosures in 2008 (Lucy 2010). The cities with the highest foreclosure rates were almost all from the Rustbelt prior to the recession, but by 2009 the top ten were all from the Sunbelt (Aalbers 2009).

Variation in foreclosure rates within individual metropolitan areas also existed. Some studies found that central cities had the highest foreclosure rates, largely due to the concentration of lower income and minority households who were more vulnerable to predatory loans (Aalbers 2009; Immergluck 2010; Molina 2016). Other studies argued that suburban and exurban communities suffered higher foreclosure rates thanks to the steep decline in housing prices in areas that developed rapidly (Lucy 2010), and attributed the crisis with accelerating the suburbanization of poverty (Anacker 2015).

More important than the intra-metropolitan location of foreclosures is the characteristics of the communities where the foreclosures were concentrated. Researchers found foreclosures to have been racially stratified, with African Americans and Hispanics

experiencing a disproportionate number of foreclosures due to the higher rates of subprime and predatory lending among racial and ethnic minorities (Aalbers 2009; Rugh and Massey 2010; Hall, Crowder, and Spring 2015). The disproportionate effects on these groups were found to remain even when controlling for factors like income and residential location (Bocian, Li, and Ernst 2010, Rugh and Massey 2010). Furthermore, neighborhoods with larger African American and Hispanic populations were more likely to remain vacant in the long term (Molina 2016). Low-income areas and neighborhoods with poorer schools were also home to a disproportionate number of foreclosures (ibid).

Foreclosure is devastating for the homeowner, but it also produces spillover effects that affect the surrounding neighborhood. Local property values are reduced which results in reduced tax revenue (Bocian, Li, and Ernst 2010; Immergluck 2010; Allen 2013; Molina 2016). Decreased tax revenue in turn threatens the provision of municipal services and quality of local school systems (Allen 2013; Molina 2016). Additionally, there may be increases in crime due to the poor condition of vacant properties and rising unemployment (Immergluck 2010; Molina 2016). Overall, the persistent presence of foreclosed properties can cause neighborhood decline, and the recession eroded neighborhood quality (Allen 2013).

It was found that the pre-recession housing boom was a key determinant of the recession's impact in different areas. The share of homes built from 2000 and 2006 was found to have a statistically significant effect on metropolitan areas' unemployment rates in later years (Gabe and Florida 2013). Metropolitan areas that experienced the greatest

increase in housing prices also experienced the earliest onset of the recession (Arias, Gascon, and Rapach 2016).

Additionally, the housing crash affected the distribution of unemployment. Migration tends to increase during recessions as the unemployed leave low-productivity areas for better job prospects elsewhere, a process known as geographical reallocation (Karahan and Rhee 2013). During the Great Recession though, plummeting house prices decreased homeowners' equity, making it difficult to afford the down payment to move into a new house. The flow of unemployed workers out of high unemployment areas was restricted. A 50% decline in net migration within the United States was observed between 2006 and 2009 (ibid). However, it is also noted that the recession was broadly based with unemployment rising across the country, so mobility was not necessarily a major advantage for the unemployed (Farber 2012).

Job Loss

Background

The Great Recession brought with it significant job losses. In the early stages of the recession, the shift in the labor market was characteristic of any economic downturn, but the ensuing depth of the decline in employment and the slow, prolonged recovery soon set apart the Great Recession as one of the most severe (Elsby, Hobijn, and Sahin 2010). Unemployment in the United States jumped from 4.4% in May of 2007 to 10.0% in October of 2009, a rapid increase unprecedented in the post-World War II era (Daly et al. 2012). This sharp rise can be attributed to an increased layoff rate, decreased hiring rate, and extended duration of unemployment (Rothstein 2014). From 2007 to 2009 the

number of people below the poverty line increased by 4.8 million, a 12.7% increase, which is largely attributable to the increase in unemployment and the surrounding circumstances of the recession (Kneebone 2010).

Recessions vary in timing, depth, and duration across the nation, although the Great Recession was one of the more uniform (Arias, Gascon, and Rapach 2016). Nonetheless, metropolitan areas were affected differently, with some experiencing deep, long-lived recessions and others short, less severe recessions. Unemployment was no different, occurring nationwide but varying in severity between locations (Kuehn 2011; Karahan and Rhee 2013). Furthermore, the labor market within each metropolitan area is heterogeneous, containing diverse populations who live in different areas and work in different industries (Kneebone 2010). Consequently, there were also sectoral and demographic patterns to unemployment during the recession.

Geographic Trends

Job loss varied at a variety of spatial scales, including regionally, between cities, and within cities. Significant job loss occurred across the country with unemployment remaining high well beyond the official end of the recession. In 2013 only two states, Minnesota and North Dakota, had unemployment rates lower than in 2007, prior to the recession (Rothstein 2014). Compared to other recessions, the Great Recession was more uniform, with unemployment rising across the country (Farber 2012). However, the degree of job loss still varied between areas. For example, a number of Californian metropolitan areas had some of the worst job loss rates (Kuehn 2011).

Within metropolitan areas, there were higher rates of job loss in the suburbs as opposed to the central cities. Kneebone (2013) found that 45% of employment losses from 2007 to 2010 occurred more than 10 miles from a metro's central business district. The prevailing trend leading up to the recession had been a steady decentralization of jobs as employment shifted to the suburbs from city centers (Kneebone 2013; Kneebone and Holmes 2015). The disproportionate job loss in the suburbs slowed this process but did not reverse it. The longer-term change in jobs from 2000 to 2012 was an increase of 4% in the suburbs and a decrease of 2% in the central cities of America's largest metropolitan areas (Kneebone and Holmes 2015).

Geographic mismatch, when unemployed workers are not located where job vacancies are concentrated, was theorized to explain the major decline in employment. Recessions typically lead to increased migration as people move to seek job opportunities, but because the housing crisis restricted people's ability to move it may have created this geographic mismatch (Karahana and Rhee 2013). However, the reduced migration was more likely due to there not being abundant job opportunities anywhere, as unemployment rose across the country (Daly et al. 2012; Sahin et al. 2014). Therefore, geographic mismatch was ruled out as an explanation for the severity and length of the spike in unemployment.

Sectoral Trends

Job loss also varied between industries and a number of sectoral trends arose. Job losses were concentrated among the construction, manufacturing, and service sectors (Clayton 2011; Rothstein 2014). Construction took a hit when the housing market

collapsed, as the housing boom had driven up employment. The manufacturing and service sectors suffered as job losses were concentrated in less skilled, manual or routine occupations (Clayton 2011).

The Great Recession saw a disproportionate loss of middle skill jobs (Autor 2010; Jaimovich and Siu 2012). One study noted that middle wage industries fared better than high or low wage industries, but this is likely due to differences in category definitions (Kuehn 2011). The loss of middle skill jobs reinforces a decades long trend of job polarization, where employment is becoming increasingly concentrated in high skill jobs and low skill jobs as middle skill jobs disappear (Autor 2010; Kuehn 2011; Jaimovich and Siu 2012). This trend has accelerated since the 1980s as automation and globalization have caused occupations that require “routine” tasks to disappear (Jaimovich and Siu 2012). The loss of these jobs is often concentrated in economic downturns, which was the case with the Great Recession (ibid).

Industry or skills mismatch, when unemployed workers do not have the work background or skills to fill nearby job vacancies, was another potential explanation for the dramatic rise in unemployment. Researchers found that industry mismatch increased during the recession, which is understandable given the contraction of the construction industry following the housing crash (Daly et al. 2012). However, no more than a third of the increase in unemployment can be attributed to this mismatch (Sahin et al. 2014). The role of skills mismatch is also questionable because unemployment rose sharply and stayed high well after the recession for workers of every education level (Shierholz 2014). However, it is noted that less skilled workers are much more vulnerable to shifts

in the labor market and were disproportionately affected by the Great Recession (Rothstein 2014).

Demographic Trends

Job loss was variable by worker demographics as well. Racial and ethnic minorities experienced a disproportionate increase in unemployment due to the recession (Shierholz 2014; Kneebone and Holmes 2015). Men and those who are less educated also saw greater job loss, which is understandable as it is the main demographic of employees in construction and manufacturing, two of the industries with the greatest job losses (Elsby, Hobijn, and Sahin 2010; Rothstein 2014). Areas with higher poverty rates also saw significant job loss, and are more vulnerable to economic shocks (Kneebone and Holmes 2015). It is important to note that identified demographic or industry patterns are indicative of any weak labor market and are not necessarily unique to the Great Recession (Rothstein 2014).

Recovery

The Great Recession was a drawn out period of hardship for many Americans, and the process of recovery proved to be no easier. As it was with the recession itself, economic recovery has varied in speed and success (Kuehn 2011). Indicators such as economic output, the stock market, and corporate profits recovered in reasonable time (Jaimovich and Siu 2012; Shierholz 2014). As opposed to employment though, whose recovery has been notably slow, these do little to help the average household (ibid). Previous recessions have shown this pattern as well, where employment fails to rebound for years following the recovery of economic output (Jaimovich and Siu 2012).

High unemployment persisted long after the end of the recession, and 7.9 million jobs were needed to return the economy to its pre-recession health as of 2014 (Sahin et al. 2014; Shierholz 2014). Hiring rates remain below pre-recession levels, and only 17 of the nation's 380 metropolitan areas had returned to their pre-recession unemployment rates by 2013 (Rothstein 2014). This depicts how some labor markets recover more quickly than others do, while some may never fully recover. Making comparisons to pre-recession statistics must be done with caution though, as the state of the economy at the time was very unsustainable.

Despite the persistence of high unemployment, it has slowly declined since the end of the recession. However, this is mainly a result of former workers no longer seeking work, reducing the labor force participation rate (Farber 2012; Rothstein 2014; Shierholz 2014). Looking instead at job creation, employment has been growing since February 2010 (Rothstein 2014). The rate of growth has barely kept pace with growth of the labor force though, resulting in the employment to population ratio remaining very low (Farber 2012; Rothstein 2014). While there was growth across the private sector post-recession, education, health, and lodging and food services were the only industries to achieve a rate of growth since 2007 that kept up with the growth of the working population (Rothstein 2014).

Extended durations of unemployment were unique to the Great Recession. The share of unemployment that was long term, as well as the average length of unemployment, rose to alarming heights, even compared to previous recessions (Daly et al. 2012; Farber 2012; Shierholz 2014). This was partly enabled by the extension of

unemployment insurance benefits (Daly et al. 2012). Long-term unemployment could easily reduce the intensity of workers' job searches or see them exit the labor market altogether, which helps explain how the drop in unemployment was driven by people leaving the work force (Daly et al. 2012, Rothstein 2014). The long-term unemployment share has since slowly fallen, but is still well above pre-recession levels (Rothstein 2014).

Research Gaps

Spatial Scale

A few gaps in the literature will be addressed in attempt to provide a unique perspective on job loss during the Great Recession. Job loss during the recession and the recovery of jobs afterwards has been studied previously, but the studies are often at a spatial scale where meaningful variation within metropolitan areas is difficult to discern. Many studies addressing various impacts of the recession have been undertaken at the national, regional, and metropolitan levels (Kneebone 2013; Anacker 2015; Arias, Gascon, and Rapach 2016). These may reveal larger scale trends, but they fail to shed light on the variation within metropolitan areas. The intra-metropolitan area patterns are important since cities are heterogeneous. Different neighborhoods have distinct characteristics and demographics, producing varied effects of the recession within metropolitan areas.

The scale of data is often a limiting factor. Data is often at the county level, which is not particularly insightful when looking for differences within metropolitan areas (Lucy 2010). Zip codes are another common unit of analysis, but can still restrict the level of spatial detail produced. This project utilizes census block data, which provides a

very fine spatial resolution, ensuring that patterns within metropolitan areas can be identified.

Comparing intra-metropolitan area patterns between cities is difficult though, due to the complexity and individuality of cities. This is especially true when considering cities of varying sizes. Consequently, broad terms are used when comparing different metropolitan areas. An approach that is commonly taken in urban geography is using the dichotomy of the urban core or central city, and the suburbs or fringe (Walker 2016; Alonso, Monson, and Cascajo 2017). These terms help evaluate intraurban differences between cities, in spite of the fact that cities are not structured so simplistically. Suburbs may not always be located in a ring around the outer edge of cities, proportionally distant from the city's center. Areas labelled suburban may also look very different between and even within different cities.

Home Location

There are studies of job loss within metropolitan areas that are of a finer spatial resolution, but they tend to use the workplace location of where jobs were either gained or lost (Kneebone 2013; Kneebone and Holmes 2015). This is a convenient measure, and it provides an indication of where jobs are concentrated and how accessible they may be. However, it fails to give insight into where the impacts of job loss are felt, as the locations of their employees are not considered. In this project, change in jobs will be analyzed using the home locations of workers.

Recovery Period

The literature does a good job of chronicling and dissecting the economic recovery following the recession. However, due to the recency of the Great Recession, many studies have not been able to analyze the full recovery. The recovery of the labor market was particularly long and drawn out, with many areas still attempting to return to pre-recession employment levels (Jaimovich and Siu 2012; Shierholz 2014). This project will provide a longer-term assessment of the recovery of jobs, which is beneficial since many of the long-term impacts of the recession remain unclear (Molina 2016).

Additionally, using a longer time period with multiple study years allows for employment changes to be tracked in sequence. While economic performance and employment were regularly tracked throughout the recession and the years following, the spatiality of these changes over a series of time periods has received less attention. Assessing the changes between multiple periods in a sequence helps provide a fuller understanding, and allows areas to be classified and mapped by the trajectory they follow (Delmelle 2016). This has been applied in other research areas to evaluate changes over time, but has not been applied to job loss during the recession.

CHAPTER III

METHODS

Scope

Metropolitan Areas

A set of ten metropolitan areas across the United States were selected for analysis in this project: Boise, ID, Cape Coral, FL, Charlotte, NC, Detroit, MI, Fresno, CA, Hartford, CT, Jacksonville, FL, Las Vegas, NV, Phoenix, AZ, and Stockton, CA (Figure 1). The number of metropolitan areas was chosen to provide a variety of different cities while staying within the time limitations of the project. The selection process began with the compilation of a shortlist of hardest hit metropolitan areas. This shortlist drew upon a number of studies that compared the performance of a large number of cities during the recession, including ones that looked at job loss by distance from the central business district (Kneebone 2013), job loss by wage group (Kuehn 2011), depth and length of recession (Arias, Gascon, and Rapach 2016), and foreclosure rates (Hall, Crowder, and Spring 2015).

The list was reduced to ten, choosing metropolitan areas that performed the worst in multiple studies (e.g. Las Vegas, Phoenix). Polycentric metropolitan areas without a strong core city were avoided (e.g. Riverside-San Bernardino-Ontario, CA), as such areas would make determining spatial patterns more difficult. Geographic diversity was strived for (Figure 1), with no more than two metropolitan areas from one state and no bordering

metropolitan areas being allowed, and with an even balance of western and eastern cities. An attempt was also made to include metropolitan areas of varying population in the study (Table 1).

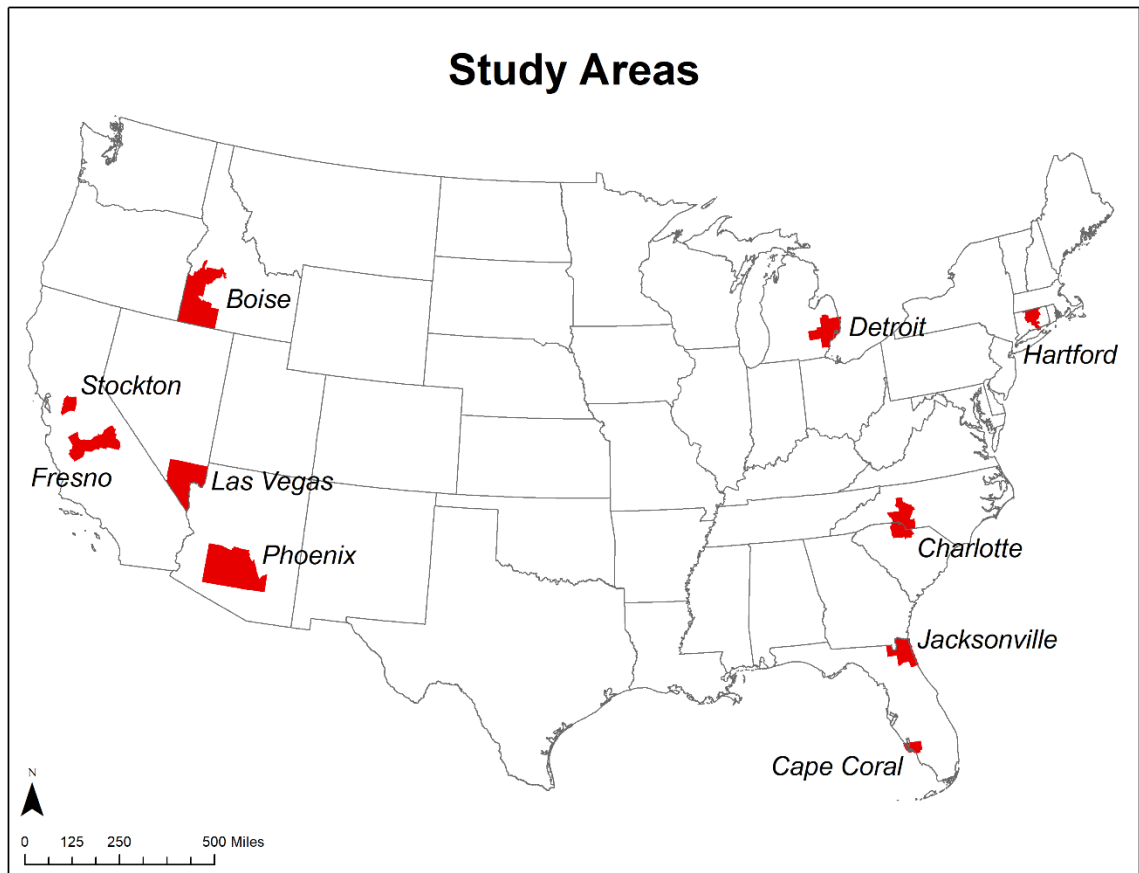


Figure 1: Locations of metropolitan areas included in the study

Table 1: Metropolitan areas included in the study by population

Metropolitan Statistical Area	Population (2010 Census)	Rank
Detroit-Warren-Dearborn, MI	4,296,250	12
Phoenix-Mesa-Scottsdale, AZ	4,192,887	14
Charlotte-Concord-Gastonia, NC-SC	2,217,012	24
Las Vegas-Henderson-Paradise, NV	1,951,269	31
Jacksonville, FL	1,345,596	40
Hartford-West Hartford-East Hartford, CT	1,212,381	44
Fresno, CA	930,450	56
Stockton-Lodi, CA	685,306	77
Cape Coral-Fort Myers, FL	618,754	84
Boise City, ID	616,561	85

Years

Change in employment within the chosen metropolitan areas was assessed between five study years: 2004, 2007, 2009, 2012, and 2015. In order to capture pre-recession levels of employment, 2007 data was used since the Great Recession officially began in December of 2007. Data for 2004 was included in order to assess the state of employment in the period leading up to the recession and to have another benchmark against which post-recession levels could be compared. The year 2009 was selected to capture employment levels at the height of the recession. Employment recovery was assessed by studying 2012, representing the short-term recovery, and 2015 (as the most recent year for which data was available), representing the long-term recovery.

Data

Annual employment data was obtained from the Longitudinal Employer-Household Dynamics (LEHD) program at the U.S. Census Bureau. Residence Area Characteristic (RAC) data was obtained from their LEHD Origin-Destination

Employment Statistics (LODES) dataset. These data provided the number of employed residents living in each census block, and that figure was categorically subset by sex, age, race, ethnicity, education, income, and job sector. The LODES datasets are available annually from 2002 to 2015 for most states, and were free for download in CSV format from the U.S Census Bureau.

The LODES datasets have a number of advantages. The data is available at a high spatial resolution (census blocks) and temporal resolution (annually). Additionally, the dataset represents a full enumeration of the employed population rather than just a sample. The data is obtained from unemployment insurance records that employers report to their state governments (Spear 2011). This results in a highly accurate national database of employee and employer information. The data is resolved to the same vintage of census blocks for all years, enabling easy comparison between years and allowing for analysis at various administrative levels. The employment data also has some limitations though. Military personnel and those who are self-employed are not captured by the dataset (ibid). Furthermore, suppressions have been applied to certain federal employment data. The coverage of employment in the United States is estimated to be above 90% even with these restrictions though (ibid). Another limitation is that the inclusion of data variables for sex, race, ethnicity, and education only began in the 2010 dataset. This restricted analysis of demographic characteristics over the recession period to the age, income, and job sector variables, which were available for all study years.

Geographic data in the form of census block shapefiles were obtained from the U.S. Census Bureau's TIGER/line files. Shapefiles containing the boundaries of the

census blocks and their geographic entity codes were downloaded for each of the states containing part of the included metropolitan areas. Shapefiles with a 2016 vintage were used, as per the specifications in the most recent LODS OnTheMap Data Notice.

Analysis

Data Processing

The Residence Area Characteristic data was pre-processed for use in this analysis of employment change. The geographic entity codes were reformatted and the CSV files were converted to DBF files to aid joining the data to the census blocks shapefiles. Additionally, the census block shapefiles were loaded into a geodatabase as feature classes. Following the pre-processing, most of the data analysis was automated using python scripting. This included calculating the change in employment for all workers, and then for each age, income, and industry category.

A python script was written and then implemented in ArcGIS to handle much of the analysis. The script required the following parameters: five digit state and county codes for all counties within the metropolitan area being processed, census blocks feature class for the corresponding state or states, DBF files of LODS data for the corresponding state or states, and the output file's name and location. The state and county codes were used to query out only those counties within the metropolitan area in question from the census block file. This was accomplished by selecting and exporting all census blocks where the first five digits of their geographic entity code matched one of the inputted codes.

Next, the LODS employment data for the state or states that contain the metropolitan area being processed were joined to the census blocks feature class. The join operation matched the geographic entity codes from the DBF files to those within the census blocks feature class. This was performed sequentially for each of the five study years.

With the employment data successfully incorporated into the census blocks feature class, a dissolve operation was performed to aggregate the data up to the census block group level. This was concluded to be a more meaningful unit of analysis. While it was important to assess trends in employment on a smaller scale, the census block proved to be unsuitable. The sheer number of census blocks within a metropolitan area would not only make it difficult to identify neighborhood or intraurban trends, but it would also greatly complicate displaying the results in a discernable manner. Most census blocks were home to a very small number of employed residents. This would allow for minor differences in employment between the study years to register as major changes percentage wise. For these reasons, the data was aggregated to the census block group level, which still provided a significant level of detail while producing a more easily understood result. The data aggregation was conducted by combining all census blocks whose first twelve digits of their geographic entity codes were identical. Data fields were summed to reflect the total values of all census blocks within a census block group.

The original LODS data files contained 20 different job sector categories representing different North American Industry Classification System (NAICS) codes. These categories were aggregated into five groups to make the job sector data more

manageable to analyze and interpret (Table 2). The new categories were given the following broad descriptors: primary, secondary, professional, retail, and public.

Table 2: Aggregated job sector categories

Job sector category	NAICS sectors from LODES dataset
“Primary”	11 – Agriculture, Forestry, Fishing and Hunting 21 – Mining, Quarrying, and Oil and Gas Extraction
“Secondary”	22 – Utilities 23 – Construction 31-33 – Manufacturing 42 – Wholesale Trade 48-49 – Transportation and Warehousing
“Professional”	51 – Information 52 – Finance and Insurance 53 – Real Estate and Rental and Leasing 54 – Professional, Scientific, and Technical Services 55 – Management of Companies and Enterprises 56 – Administrative and Support and Waste Management and Remediation Services
“Retail”	44-45 – Retail Trade 71 – Arts, Entertainment, and Recreation 72 – Accommodation and Food Services
“Public”	61 – Educational Services 62 – Health Care and Social Assistance 81 – Other Services (except Public Administration) 92 – Public Administration

With the data properly formatted, the overall change in employment between study years could be calculated, followed by the change for each age, income, and industry category. New fields were created to store the calculated change, resulting in four fields for each data variable that was present in the LODES dataset in all five study years (Table 3). The difference between successive years was then calculated and used to populate the new fields. The same process was followed to calculate the percent change between study years for each of the variables, and populate the corresponding fields.

Table 3: Data variables for which change was calculated

Data Variables
Total number of employed residents
Number of employed residents age 29 or younger
Number of employed residents age 30 to 54
Number of employed residents age 55 or older
Number of employed residents with earnings \$1250/month or less
Number of employed residents with earnings \$1251/month to \$3333/month
Number of employed residents with earnings greater than \$3333/month
Number of employed residents working in the “primary” sector
Number of employed residents working in the “secondary” sector
Number of employed residents working in the “professional” sector
Number of employed residents working in the “retail” sector
Number of employed residents working in the “public” sector

Employment Trajectories

Once the change in employment was calculated, the raw or percent change between each study year across the different metropolitan areas could have been assessed to evaluate patterns of job loss and recovery. However, that assessment is not easily done due to the large quantity of data. Some type of synthesis would prove beneficial to represent employment change over the entire study period, in such a way that allowed comparison across ten different metropolitan areas. The chosen solution was a classification of the census block groups based on their trajectories of employment from 2007 onward. This approach has been noted for its usefulness in grouping areas that followed similar paths and in providing a method for mapping dynamics over multiple time periods (Delmelle 2016).

The 2007 level of employment was used as a benchmark against which later study years were compared. The numbers of employed residents in 2009, 2012, and 2015 were compared against the pre-recession 2007 number to determine the nature of job loss and

recovery within each census block group. These comparisons were used to develop a classification system with five employment trajectories (Table 4).

Table 4: Employment trajectories

	Employment in:		
	2009	2012	2015
	compared to 2007		
Yet to fully recover	Below	Below	Below
Yet to fully recover, late onset	Above	Below	Below
Recovered by 2015	N/A	Below	Above
Recovered by 2012	Below	Above	N/A
Nothing to recover from	Above	Above	N/A

The first trajectory applies to census block groups where employment in 2009 was below 2007 levels and it remained below the pre-recession level in 2012 and 2015 as well. This category represents areas that as of 2015 still had not fully recovered from job loss during the Great Recession. The second trajectory describes areas where the number of employed residents in 2009 was higher than in 2007, but in 2012 and 2015 employment was below pre-recession levels. This category represents a late onset of the recession (or perhaps a delayed impact on employment), since in 2009 employment had yet to fall below pre-recession levels, and as of 2015 still had not fully recovered. The third trajectory refers to census block groups where employment was below the 2007 level in 2012, but managed to exceed that level by 2015. The figure for 2009 is disregarded; whether employment had fallen by that time or not, the fact that recovery was attained between 2012 and 2015 is what is important to the discussion. The fourth trajectory applies to areas that saw employment drop below 2007 levels by 2009, but were able to exceed them by 2012. The figure for 2015 is disregarded as recovery has already been achieved by 2012 and any subsequent change by 2015 would not be closely

related to the recession. The fifth and final trajectory is for census block groups where the number of employed residents in 2009 and 2012 was above that in 2007. This category represents areas that had no net loss of employment during the recession from which to recover. Again, 2015 employment is considered irrelevant to this category as employment levels greater than in 2007 were sustained through the recession and years following.

The final step of the methodology was to compile the results. Citywide totals were gathered for each data variable for every study area and every study year. Maps and charts illustrating the change in employment, variation by certain data variables, and the different trajectories were produced.

CHAPTER IV

RESULTS

Inter-Metropolitan Area Patterns

Change in Employment

The overall changes in employment in the ten selected metropolitan areas were evaluated for the periods between 2004, 2007, 2009, 2012, and 2015 to capture employment trends before, during, and after the Great Recession. The various trends between the ten metropolitan areas are illustrated by two figures, the first of which depicts the percent change in the employed population between the study years (Figure 2). The second shows the employed population relative to 2007, the year that acts as the pre-recession benchmark when evaluating recovery (Figure 3).

Additionally, the change in employment in every census block group was calculated and mapped across each time period (Appendix A)

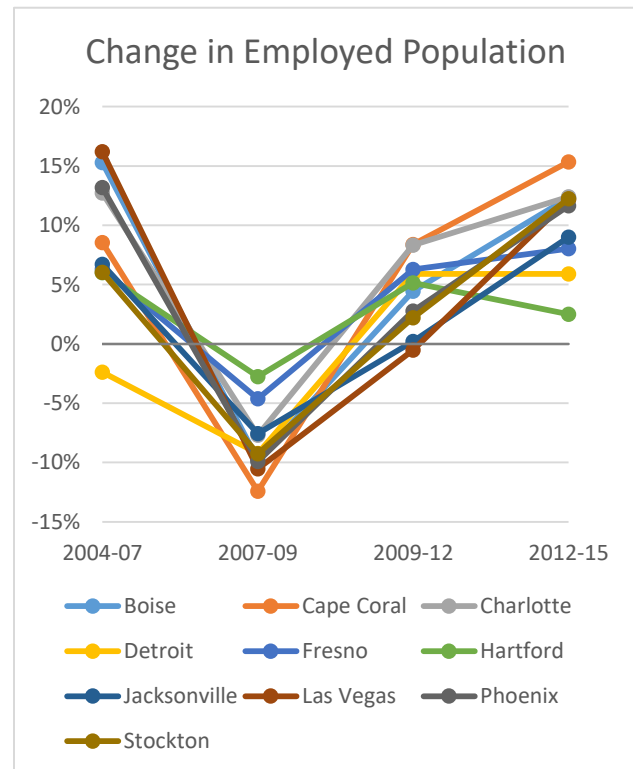


Figure 2: Percent change in employed population

to allow intra-metropolitan area patterns to be identified, which will be explored in a later section.

Nine of the ten metropolitan areas saw their employed population increase in the period leading up to the Great Recession, 2004 to 2007, with Detroit being the lone outlier. Between 2007 and 2009, all ten metropolitan areas experienced a decline in their employed population. The declines ranged from a 2.8% decrease in

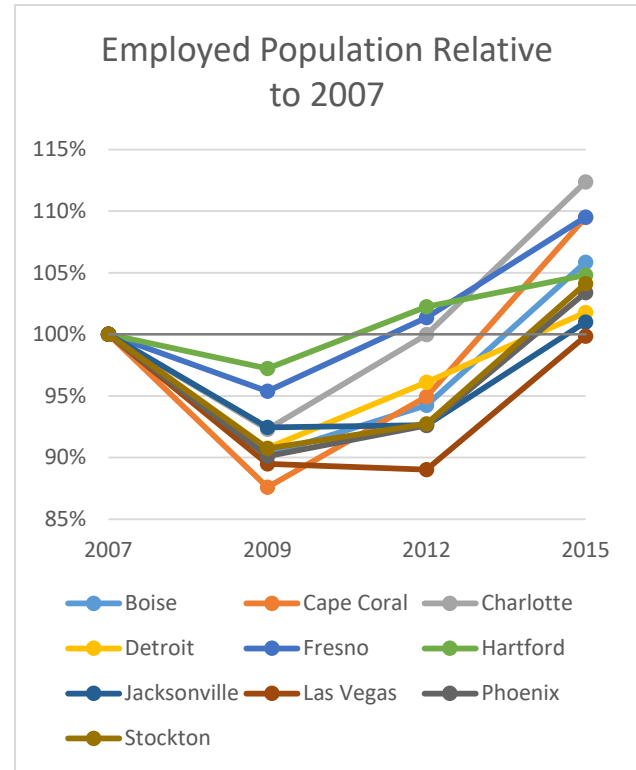


Figure 3: Employed population relative to 2007

Hartford to a 12.4% decrease in Cape Coral.

Eight of the cities rebounded substantially in the period from 2009 to 2012; Cape Coral and Charlotte led the way with increases over 8%. This marks a quick turnaround for Cape Coral after experiencing the greatest decline during the recession. Of the eight cities that rebounded, Hartford and Fresno were the only two that surpassed their pre-recession (2007) employment levels by 2012, with a third, Charlotte, recovering to 99.98% of their pre-recession employment level. Las Vegas and Jacksonville were the two out of the ten that languished in their recovery, experiencing changes of -0.5% and +0.2% respectively. A second consecutive period of employment decline saw Las Vegas drop to 89.0% of its pre-recession employed population.

Between 2012 and 2015, all ten metropolitan areas saw increases in their employed population, ranging from 2.5% in Hartford to 15.4% in Cape Coral. As a result, another seven cities joined Hartford and Fresno in exceeding their pre-recession employment levels. The lone remainder, Las Vegas, recovered to 99.85% of their pre-recession employment level. At the other end of the spectrum, Charlotte boomed to 112.4% of their pre-recession employment.

Recession and Recovery Trajectory

In order to depict the changes in employment within a metropolitan area throughout the recession and subsequent recovery in a single map, census block groups were assigned trajectory categories based on the employed population totals for 2007, 2009, 2012, and 2015. Five different categories were developed (Table 4). There are two categories for areas that are still below their 2007 employment figure as of 2015, one for areas which fell below the pre-recession level from 2007 to 2009 and one for areas which only fell below from 2009 to 2012. There are three categories for areas that have exceeded their 2007 employment figure as of 2015, one for areas which never fell below the pre-recession level, one for areas that fell below and recovered by 2012, and one for areas that recovered by 2015. These recession and recovery trajectories were then mapped for each of the metropolitan areas (Appendix B).

The broad trends in recovery between different cities can be identified from Figure 4, which shows the percentage of census block groups that fell into each employment trajectory category. Most observations are consistent with the overall changes in employment. Las Vegas and Jacksonville contained the highest proportion of

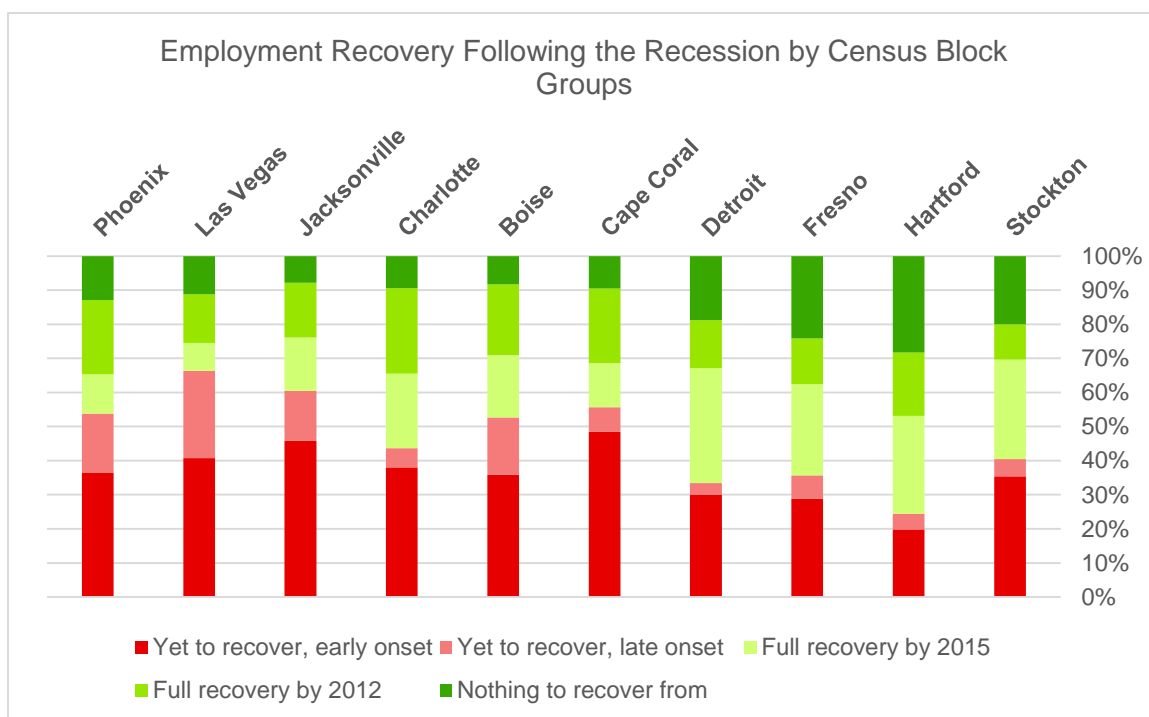


Figure 4: Employment recovery following the recession by census block groups

census block groups still below pre-recession employment levels in 2015. Cities with the smallest employment declines, like Hartford and Fresno, show the highest proportion of census block groups which never fell below their 2007 employment level. Metropolitan areas which saw significant employment loss but also a fast recovery, including Charlotte and Cape Coral, exhibit a greater percentage of census block groups recovering by 2012. There was a notably large proportion of census block groups only experiencing net job loss after 2009 in cities such as Las Vegas and Phoenix.

Alarming, while the ten metropolitan areas have all returned to and exceeded 2007 employment figures by 2015 (or very nearly in the case of Las Vegas), many of them have a significantly large proportion of census block groups that have not done so (Figure 4). In five metropolitan areas, over half of their census block groups remain

below pre-recession employment levels. This suggests that recovery has been concentrated in certain areas within cities, allowing the overall number of employed residents to recover while large areas struggle to recover.

Age

The change in the employed population between each study year was also broken down by a number of socioeconomic characteristics, age being one of them. Three age categories were used when comparing employment change: 29 years old and younger, 30 to 54 years old, and 55 years old and older (Table 3). It was found that during the recession, the younger age group experienced the greatest employment decline among the three age categories in all ten metropolitan areas (Figure 5). The decreases among the younger group ranged from 6.0% in Hartford to 24.3% in Phoenix. Conversely, the older age group did the best out of the three groups in all ten cities, ranging from a 6.6%

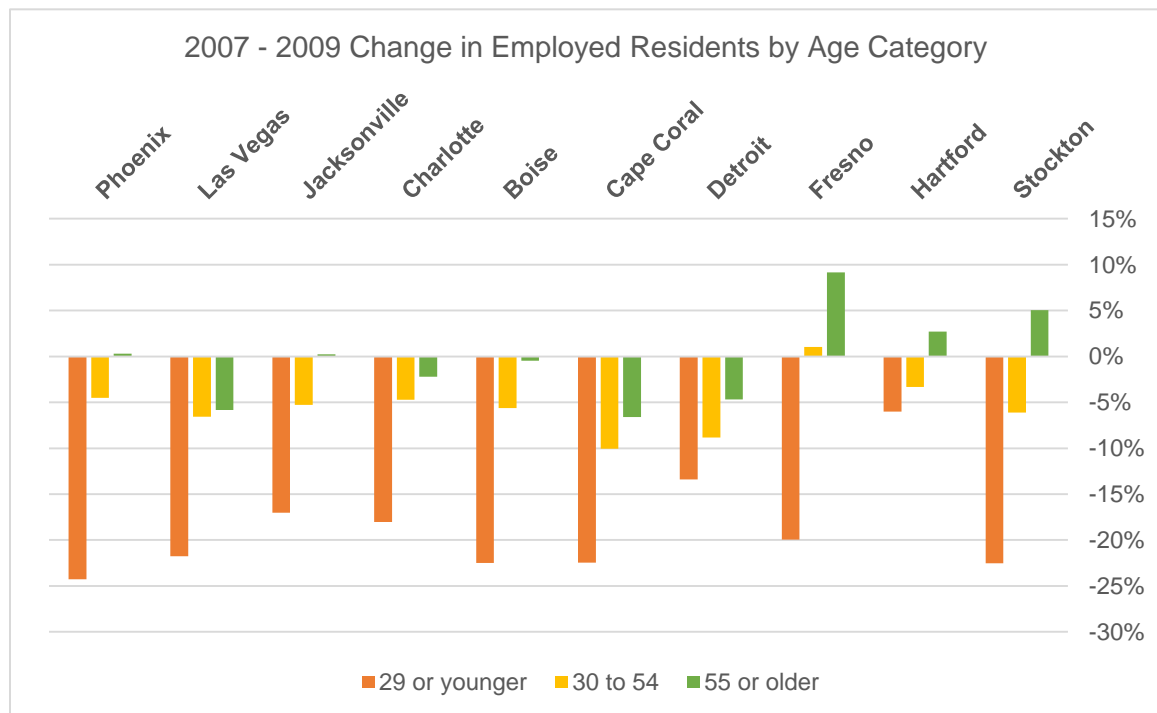


Figure 5: Change in employed residents by age category 2007-2009

decrease in Cape Coral to a 9.2% increase in Fresno. The older group saw increases in five of the ten metropolitan areas, and the middle-aged group increased in one, Fresno. Hartford had the narrowest difference between the three age categories, only varying from a 6.0% decrease for the younger group to a 2.7% increase for the older group, an 8.7% spread. Fresno had the greatest difference, ranging from a 19.9% decrease for the younger group to a 9.2% increase for the older group, a 29.1% spread.

The change in the employed population for each age category was mapped for the period from 2007 to 2009 and charted for every study year for each of the study cities (Appendix C). Generally, the younger category experienced the greatest employment loss during the Great Recession, followed by the middle-aged group, and then the older category fared the best (e.g. Jacksonville, Figure 6). This pattern tended to continue into the recovery period. The rates of employment change usually improved for the 2009 to 2012 period, but remained in the same order with the younger group faring the worst and the older group faring the best. The main exception to this trend was Detroit, where the middle-aged group had more difficulty recovering from their recession losses than the younger group (Figure 7).

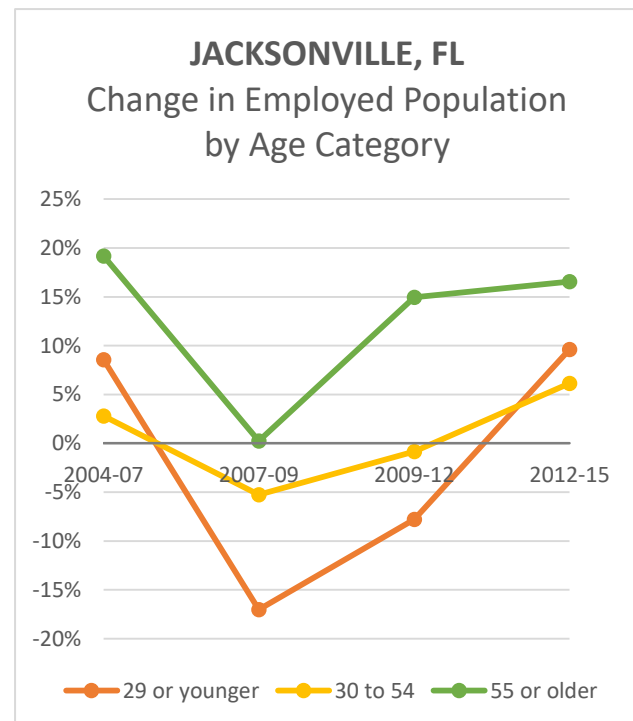


Figure 6: Jacksonville change in employed population by age category

Looking at each group individually, the younger age category experienced the greatest struggles. As of 2015, the number of employed residents age 29 and younger had not yet returned to pre-recession employment levels in nine of the ten metropolitan areas. The lone city that recovered to 2007 levels was Detroit, where employment had already been declining prior to the recession. Not only did the younger group see the greatest employment losses during the recession in all ten cities, but in six of the ten there was a further decline in employment in the 2009 to 2012 period among those under 30 (e.g. Stockton, Figure 8).

The middle-aged category fared better than the younger group, experiencing significant employment losses but recovering from them for the

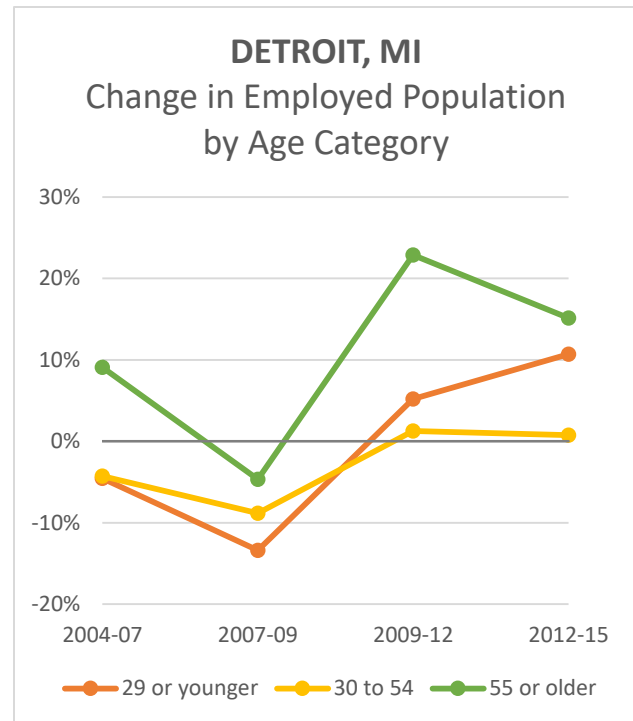


Figure 7: Detroit change in employed population by age category

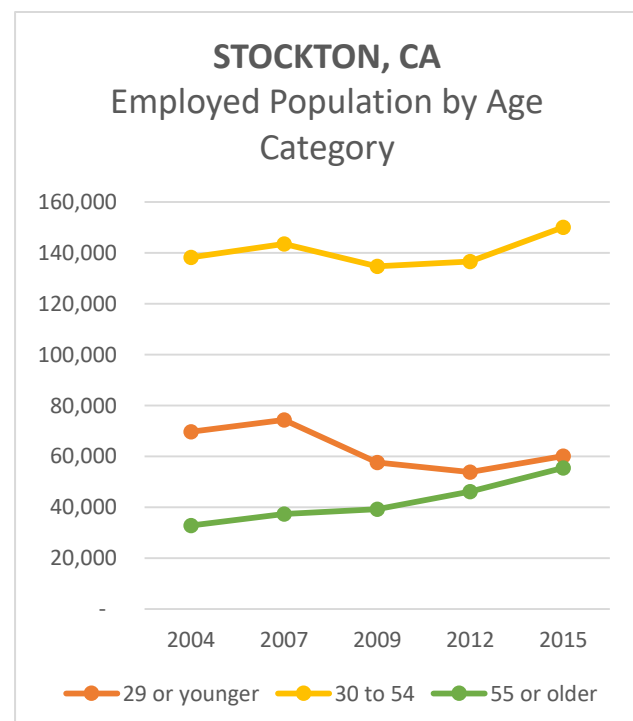


Figure 8: Stockton employed population by age category

most part. In three of the ten metropolitan areas, the number of employed middle-aged residents remained below pre-recession levels as of 2015 (e.g. Detroit, Figure 9). However, middle-aged employment was able to recover by 2015 in five of the ten cities. In Charlotte it had already recovered by 2012 (Figure 10), and in Fresno it never decreased during the recession.

The older age category weathered the recession very well, experiencing an increase in their employed population in five of the ten cities from 2007 to 2009. Furthermore, the other five cities all exceeded their pre-recession employment by 2012 (e.g. Cape Coral, Figure 11), meaning any employment losses among those aged 55 and older were quickly recovered.

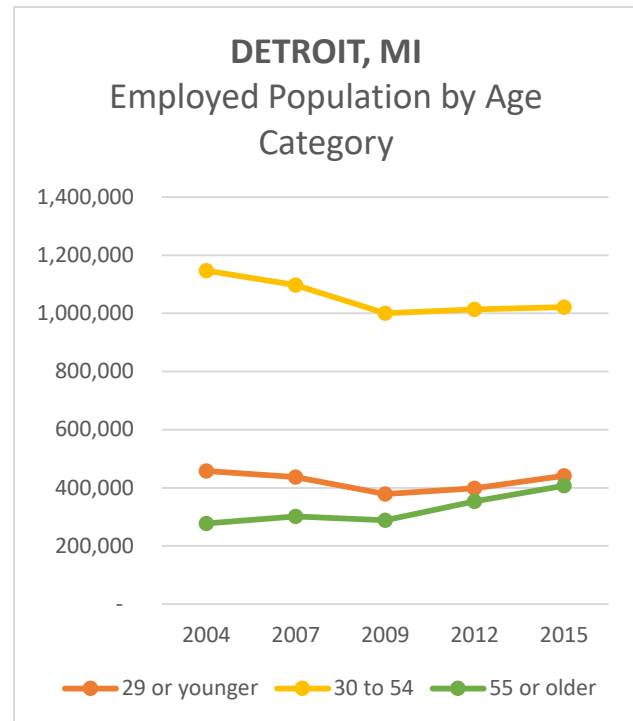


Figure 9: Detroit employed population by age category

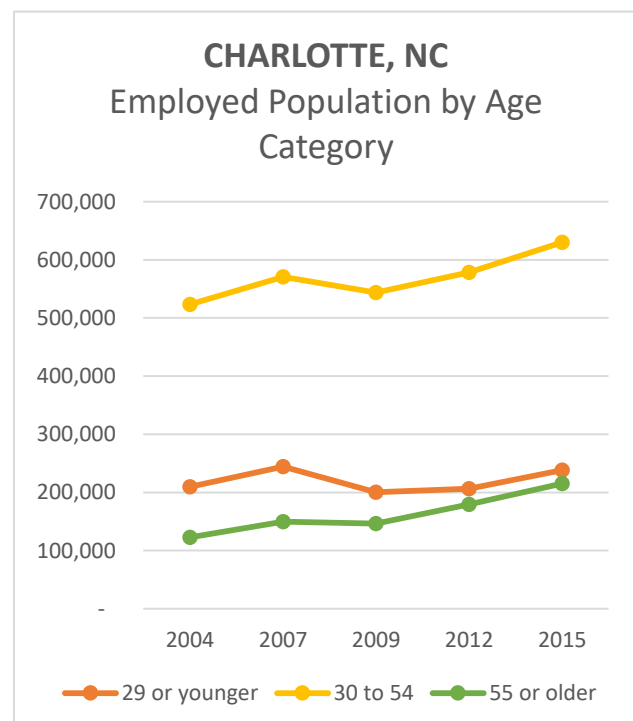


Figure 10: Charlotte employed population by age category

Income

Another socioeconomic factor by which the change in the employed population was broken down by is income. Three income categories were used when comparing employment change: earnings of \$1250 or less per month, earnings of \$1251 to \$3333 per month, and earnings of \$3334 or more per month (Table 3). It was found that during the recession, the lower income category generally saw the greatest

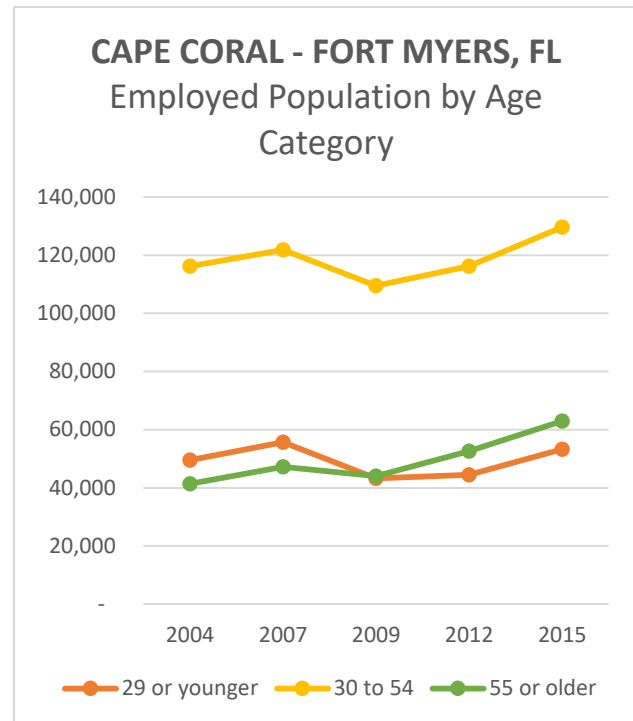


Figure 11: Cape Coral employed population by age category

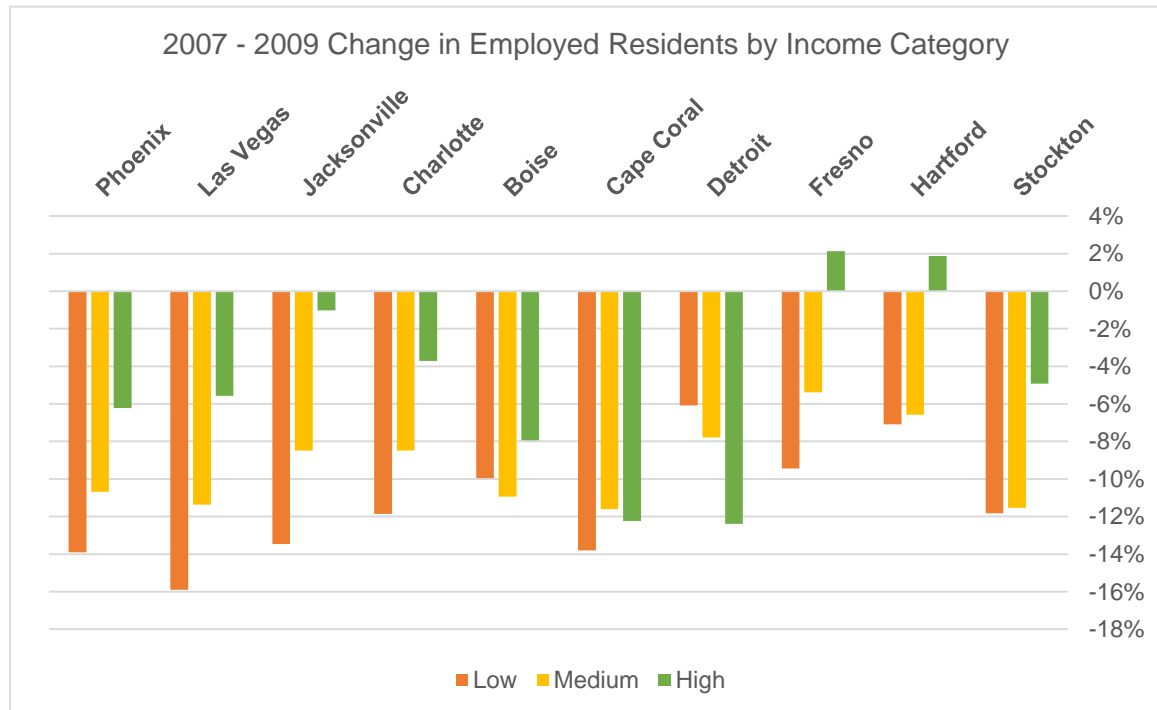


Figure 12: Change in employed residents by income category 2007-2009

decrease in employment (Figure 12). It was followed by the medium income group, and the higher income group saw the least overall employment decline of the three income categories.

The lower income group experienced the greatest proportional employment loss from 2007 to 2009 in eight of the ten metropolitan areas. Among the ten cities, change for the lower income category ranged from a decrease of 6.1% in Detroit to 15.9% in Las Vegas. The two others were Boise, where the medium income group had slightly higher employment loss, and Detroit where the higher income group had the highest employment loss. Conversely, the higher income group fared the best among the three income groups in eight of the ten metropolitan areas, with two of those eight, Fresno and Hartford, seeing employment increases during the recession. The two others were Cape Coral, where the medium income group fared the best, and Detroit, where the lower income group had the lowest employment decrease. Across all ten cities, change in employment for the higher income category varied from a decrease of 12.4% in Detroit to an increase of 2.1% in Fresno.

The narrowest difference between the three income categories was found in Cape Coral where it varied from a decrease of 11.6% for the medium income group to a decrease of 13.8% for the lower income group, a spread of 2.2%. Jacksonville was home to the widest difference, with decreases of 1.0% for the higher income group and 13.5% for the lower income group resulting in a 12.5% spread.

The change in the employed population for each income category was mapped for the period from 2007 to 2009 and charted for every study year for each of the study cities

(Appendix D). In general, the lower income category experienced the greatest employment loss during the Great Recession, closely followed by the medium income category, and then the higher income category fared the best. This hierarchy of performances is clearly demonstrated by the example of Fresno in Figure 13. Similar to the example of Fresno, most metropolitan areas saw the percent change in employment for their lower and medium income groups closely mirror one another post-recession.

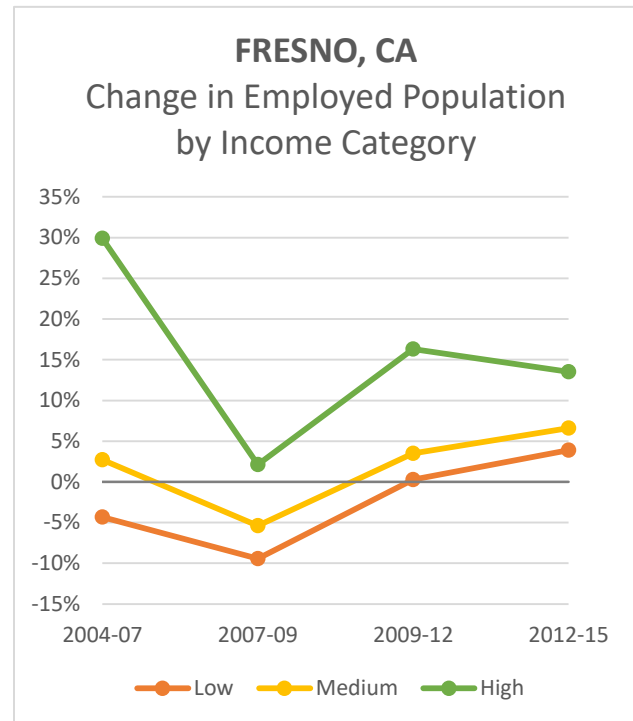


Figure 13: Fresno change in employed population by income category

The post-recession period proved to be difficult for the lower and medium income categories, as many metropolitan areas saw further employment loss from 2009 to 2012 among these groups, and all ten cities struggled to return to pre-recession employment levels. Contrastingly, there has been significant and sustained post-recession growth in the number of higher income employed residents. Detroit (Figure 14) and Hartford (Figure 15) are two of the more extreme examples, as they experienced decline in their lower and medium income employed populations even before the recession began, and that decline largely continued throughout the recession and recovery period. However,

strong post-recession employment growth in the higher income category has allowed their overall number of employed residents to exceed pre-recession levels.

The similarities between the lower and medium income categories allow them to be evaluated together. Both experienced significant employment losses during the recession, and for each category there were five metropolitan areas that experienced further employment decline from 2009 to 2012. Both have also struggled to recover from their losses, with each category having eight metropolitan areas that were below their 2007 employment level as of 2015, and many of those falling below their 2004 level as well. Las Vegas (Figure 16) exemplifies this pattern, with both the lower and medium

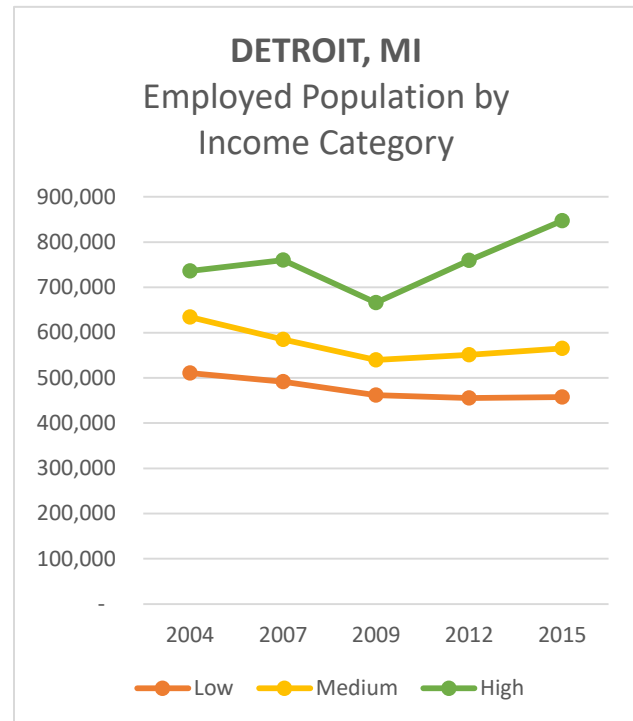


Figure 14: Detroit employed population by income category

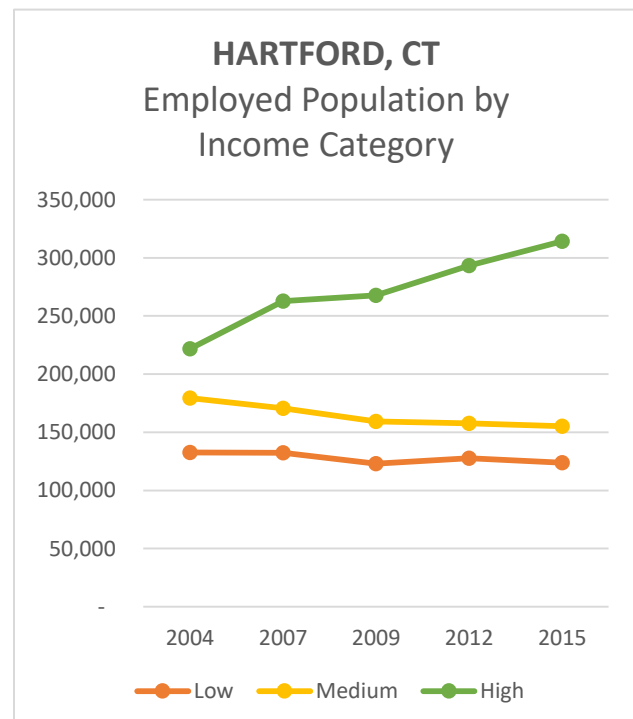


Figure 15: Hartford employed population by income category

income groups experiencing further employment loss in the 2009 to 2012 period and their 2015 employment levels remaining well below the pre-recession markers.

The higher income category showed more variability than the other income categories, with two cities seeing employment increase during the recession (Fresno and Hartford) while three experienced losses that were only recouped by 2015 (Cape Coral, Detroit, and Las Vegas). Despite this variability, the higher income category was by far the strongest performer. This was particularly evident post-recession when significant and sustained employment growth counteracted any losses that may have occurred. Jacksonville clearly represents the patterns exhibited by the higher income group (Figure 17). The

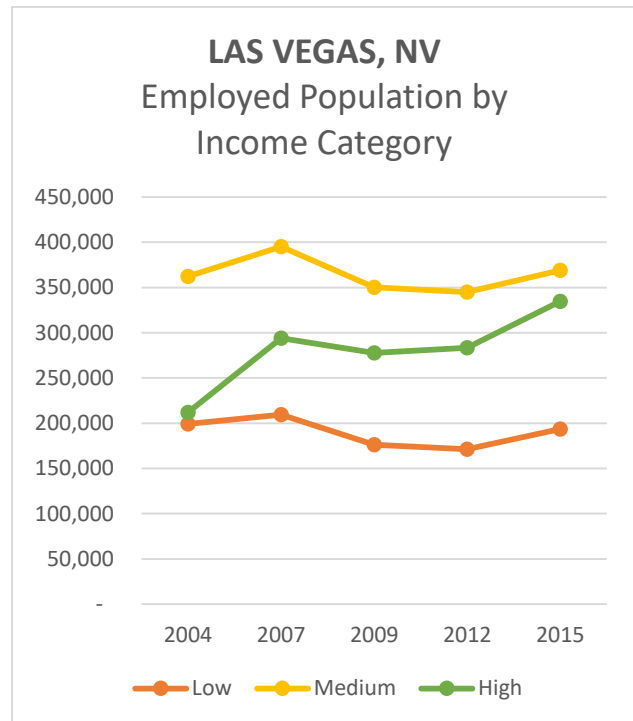


Figure 16: Las Vegas employed population by income category

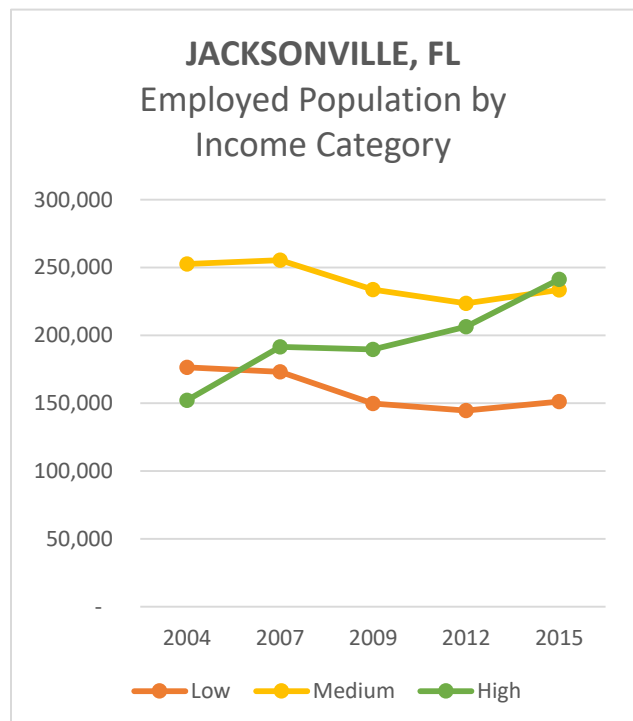


Figure 17: Jacksonville employed population by income category

number of higher income employed residents did not decline at nearly the same rate that lower and medium income employed residents did. Post-recession, the lower and medium income groups made very little recovery while the number of higher income employed residents grew.

Industry

Job sector or industry was the third socioeconomic factor against which employment change during and after the Great Recession was compared. Five industry categories were created by aggregating various job sectors, and were loosely described as primary (agriculture, forestry, mining, oil and gas extraction), secondary (utilities, construction, manufacturing, transportation), professional (finance, real estate, management, scientific and technical services), retail (retail trade, accommodation and food services, arts, entertainment, recreation,), and public (education, health care, public administration, other services) (Table 2).

During the recession, the secondary industry category was found to have experienced the greatest employment loss (Figure 18). It had the greatest decrease in employment among the five industry categories in nine of the ten metropolitan areas, and in the tenth, Las Vegas, it had the second greatest decrease. Secondary industry change in employed residents ranged from an 8.3% decrease in Hartford to a decrease of 31.5% in Cape Coral. The top performer was the public industry category, which experienced employment growth during the recession in nine of the ten metropolitan areas, with Cape Coral being the lone city experiencing a decrease. Employment change for the public industry category ranged from a 1.1% decrease in Cape Coral to a 10.7% increase in

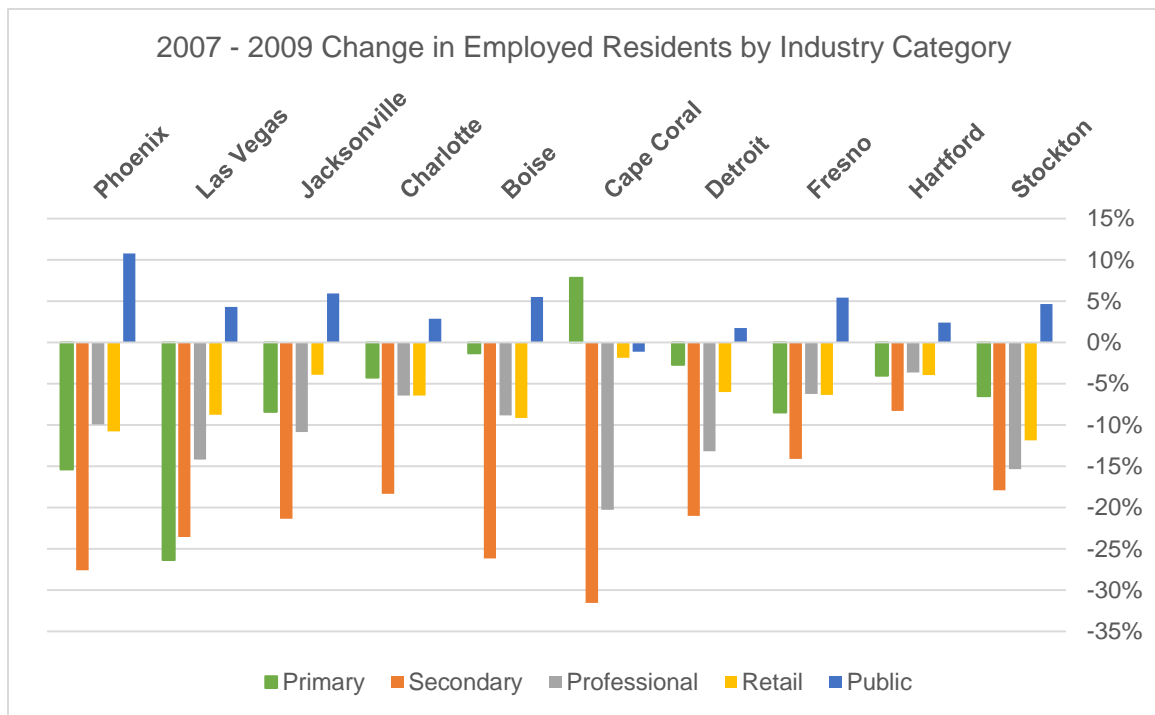


Figure 18: Change in employed residents by industry category 2007-2009

Phoenix. The employment change for the professional and retail categories fell between the secondary and public industry categories in all ten metropolitan areas. Both saw significant declines in employment, although the professional industry generally experienced greater loss. Change in employed residents working in the primary industry was highly variable, from the worst employment loss in Las Vegas with a 26.4% decrease, to top performer in Cape Coral with a 7.8% increase. This is likely due to the miniscule size of the primary industry category in most of the metropolitan areas, allowing a decrease or increase of only a couple hundred employed residents to result in sizable proportional losses or gains.

Hartford had the narrowest difference in employment change during the recession between the industry categories, with a decrease of 8.3% in the secondary industry and an

increase of 2.4% in the public industry category, a spread of 10.7%. The widest difference was found in Cape Coral where employment in the secondary industry declined by 31.5% and the primary industry increased by 7.8%, resulting in a 39.3% spread.

The change in the employed population for each industry category was mapped for the period of 2007 to 2009, and charted for every study year for each of the study cities (Appendix E). Generally, during the recession all but the public industry category saw significant employment decline, with the secondary industry experiencing the most severe decrease. Post-recession, the recovery of employment was unsuccessful for the secondary industry category in all of the cities, but the other four industry categories were largely able to recover employment losses or continue growing in the case of the public industry. Phoenix demonstrates these general trends well (Figure 19 and Figure 20). There was a swift drop in employment in the secondary industry from which recovery is yet to be achieved. Employment in the professional and retail industries also declined, but has since recovered, and the public industry had continued growth throughout and following the recession.

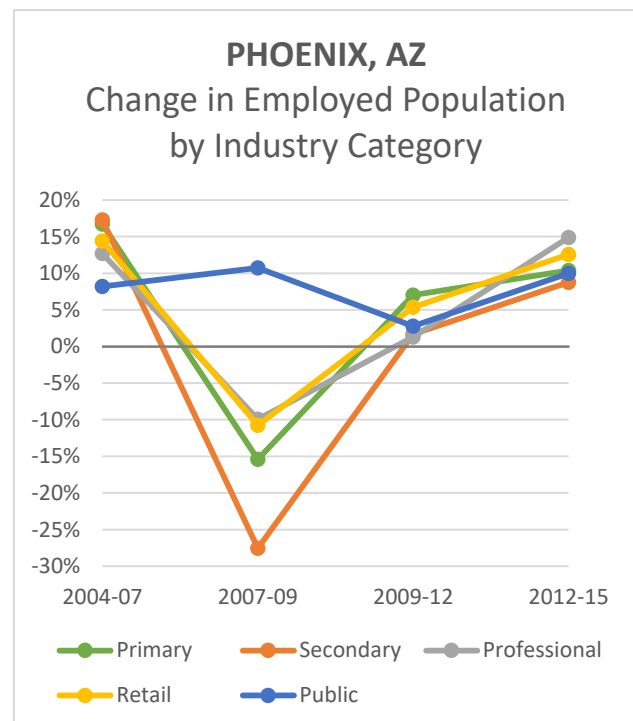


Figure 19: Phoenix change in employed population by industry category

Considering each of the industry categories separately, the primary industry was widely varied in its employment trajectories during and after the recession. As mentioned previously, the variance can be attributed to the low number of residents employed in this industry category. This is evident in Phoenix, where primary industry employment declined by 15.4% during the recession (Figure 19), but the raw employment change was a decrease of only 2,278 (Figure 20). The two metropolitan areas with a sizable proportion of their labor force working in the primary industry, Fresno (Figure 21) and Stockton, experienced a decline in employment that began before the recession and continued through it, before rebounding post-recession.

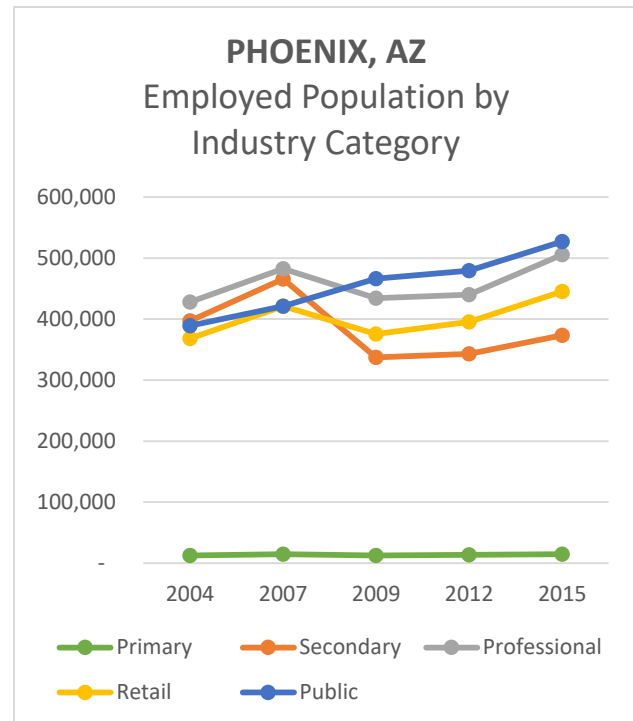


Figure 20: Phoenix employed population by industry category

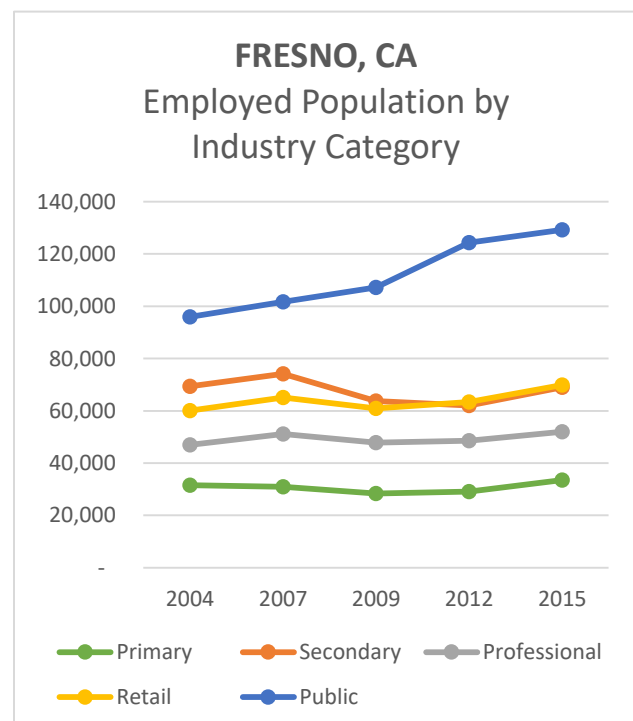


Figure 21: Fresno employed population by industry category

The number of employed residents in the secondary industry category majorly decreased during the recession in all ten metropolitan areas. In five cities, there was further employment decrease from 2009 to 2012. The severe employment decline made recovery difficult. As of 2015, none of the study cities had returned to their 2007 secondary industry

employment level, and only four were able to recover to their 2004 employment level. Las Vegas is one of the most severe examples, with secondary industry employment plummeting from 2007 to 2012 (Figure 22). While still somewhat bleak, the example of Charlotte (Figure 23) presents the best case among the study cities for the secondary industry, with strong employment growth from 2012

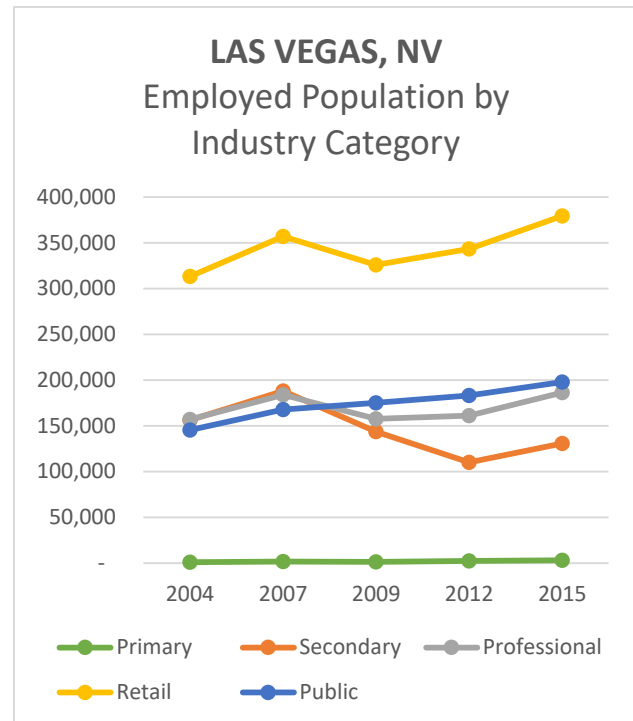


Figure 22: Las Vegas employed population by industry category

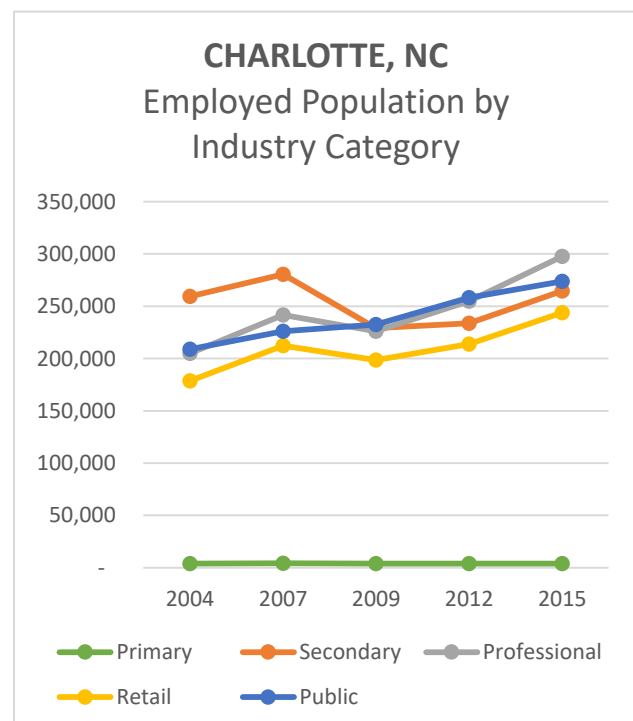


Figure 23: Charlotte employed population by industry category

to 2015 propelling the number of employed residents above the 2004 marker.

The professional industry category experienced significant employment decline during the recession, second only to the secondary industry in many cases. The professional industry fared better at recovering their employment losses though. Two metropolitan areas recovered to pre-recession levels by 2012 (e.g. Charlotte, Figure 23) and another five recovered by 2015, while Cape Coral (Figure 24), Jacksonville, and Stockton were unable to recover by 2015.

The retail industry category followed a very similar trajectory to the professional category, albeit with slightly reduced employment losses and improved recovery. The two

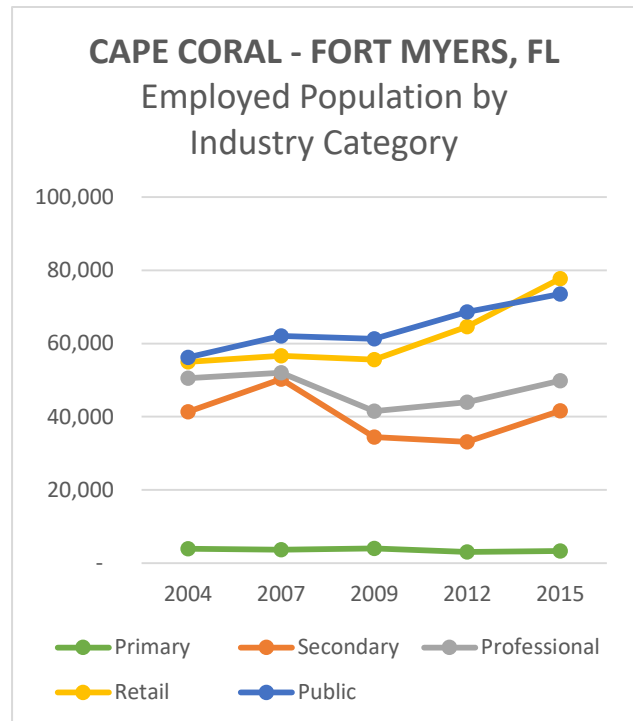


Figure 24: Cape Coral employed population by industry category

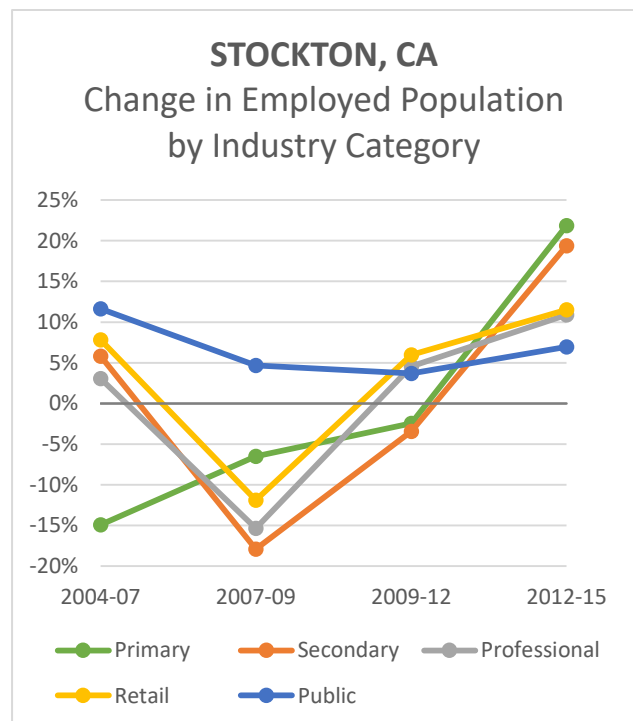


Figure 25: Stockton change in employed population by industry category

industries had very similar employment trends during and after the recession in a majority of the cities, including Stockton (Figure 25) and Boise (Figure 26). Similar to the professional industry category, the retail category also experienced significant employment decline, but differed slightly in its recovery. Three metropolitan areas recovered to their pre-recession retail employment level by 2012 (e.g. Charlotte, Figure 23), and the remaining seven were all able to do so by 2015.

The public industry category came out of the recession the most unscathed compared to the other categories. In nine of the ten metropolitan areas the number of public industry employed residents increased during the recession, and in the tenth, Cape Coral, the decrease was

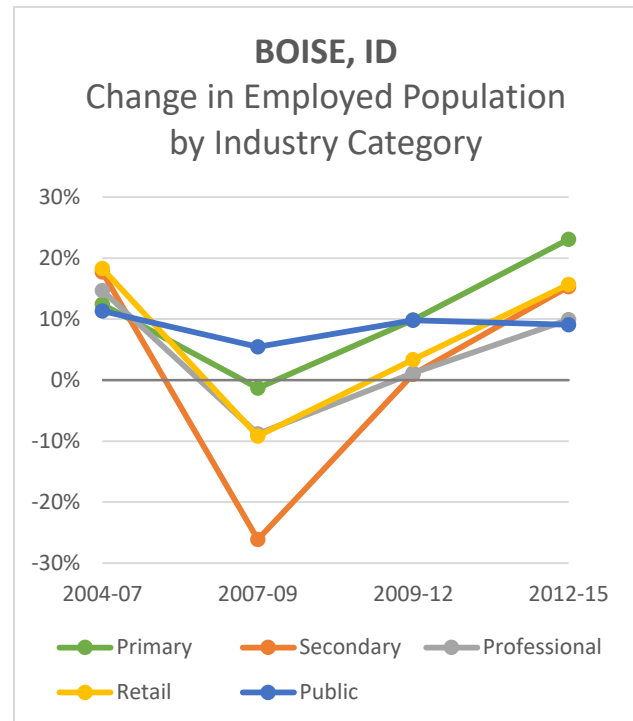


Figure 26: Boise change in employed population by industry category

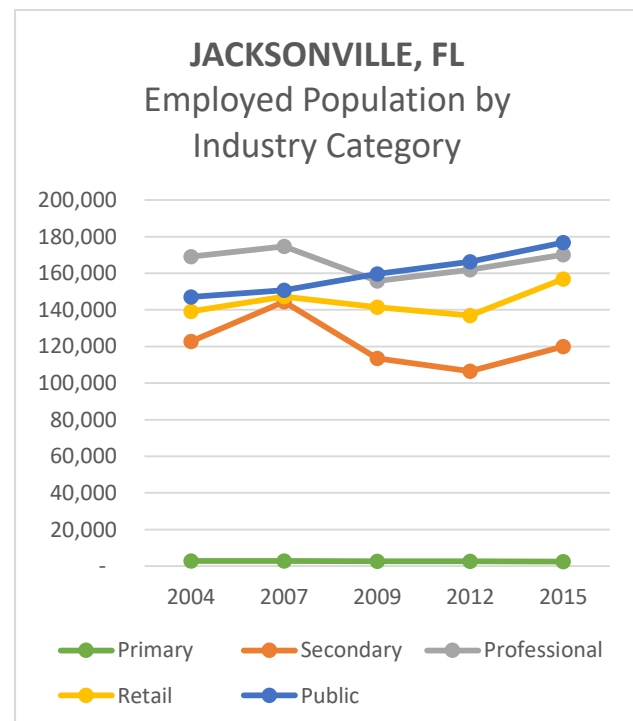


Figure 27: Jacksonville employed population by industry category

small. Post-recession, this growth remained steady, helping bolster overall recovery efforts. Jacksonville illustrates both the increase in public industry employment during the recession and the continued growth post-recession (Figure 27).

Intra-Metropolitan Area Patterns

Change in Employment

In addition to the comparisons that were made between metropolitan areas, the changes in the number of employed residents were also compared within metropolitan areas. This was accomplished by mapping the change in employment by census block group across each time period for all ten study cities (Appendix A). This finer scale analysis allowed intra-metropolitan area spatial patterns to be identified.

The period from 2007 to 2009 naturally saw widespread loss of employment across most of the metropolitan areas. Within metropolitan areas, the prevailing spatial trend of employment change during this period was that of greater employment loss around the periphery and more minimal employment loss, or in some cases employment gain, in the core of the city. While not present in all ten cities, and appearing more pronounced in some cities than others, this pattern was the most discernable trend from 2007 to 2009. Phoenix (Figure 28) and Charlotte (Figure 29) provide some of the clearest evidence of the greater employment loss around the periphery of cities. The pattern is quite apparent in Phoenix, with employment growth in the core of the metropolitan area and significant loss almost everywhere beyond. In Charlotte, there is more minimal employment change in the center of the metropolitan area, but a ring of greater employment loss runs around the periphery of the city.

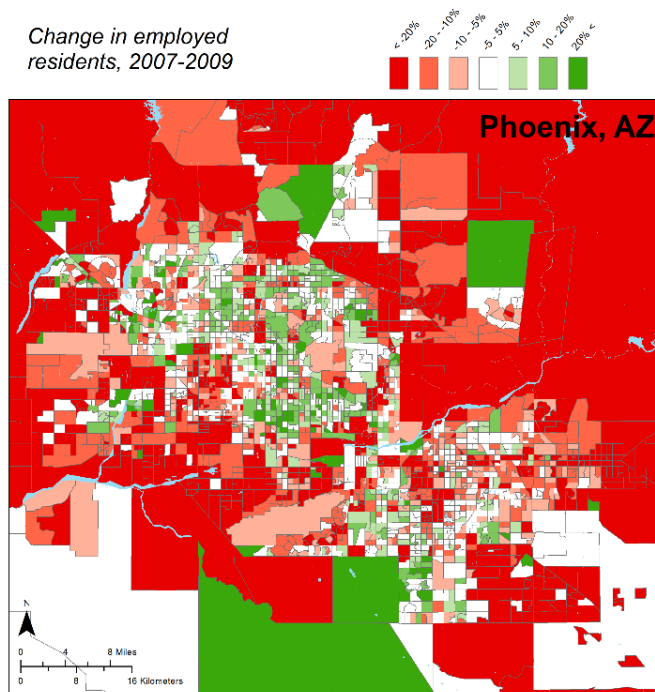


Figure 28: Phoenix change in employed residents 2007-2009

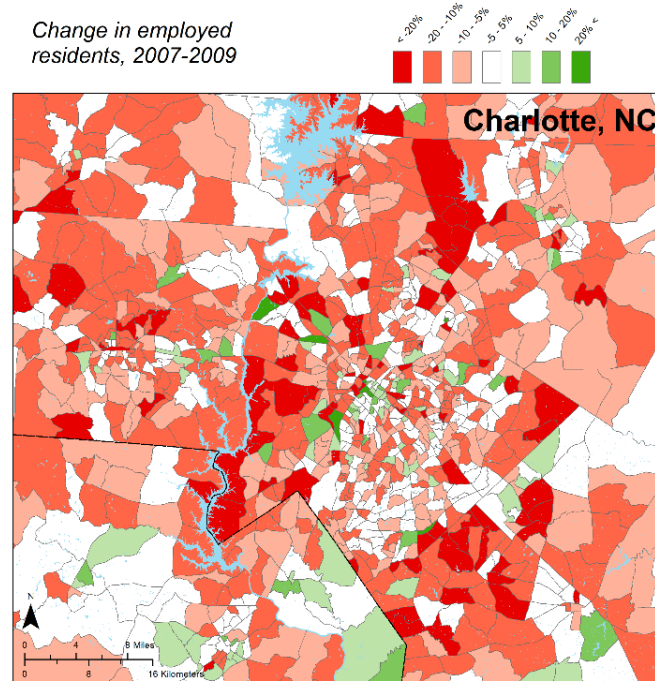


Figure 29: Charlotte change in employed residents 2007-2009

Jacksonville was the lone city to exhibit an opposing trend, with significant job loss in the city core and pockets of growth in the outer reaches of the metropolitan area (Figure 30). Some of the metropolitan areas, especially those with more limited employment loss, lacked any pronounced trend, experiencing a scattered mix of employment gains and losses (e.g. Hartford, Figure 31).

The period from 2009 to 2012 saw a mix of employment growth and loss as some metropolitan areas were in full recovery mode (e.g. Hartford, Figure 32) while others were still reeling from the recession (e.g. Las Vegas, Figure 33). Regardless of the mix of growth and loss, the

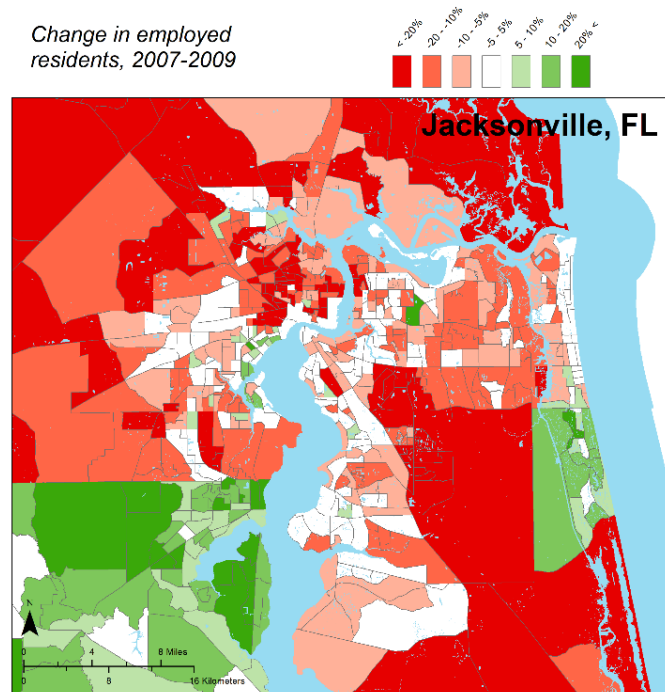


Figure 30: Jacksonville change in employed residents 2007-2009

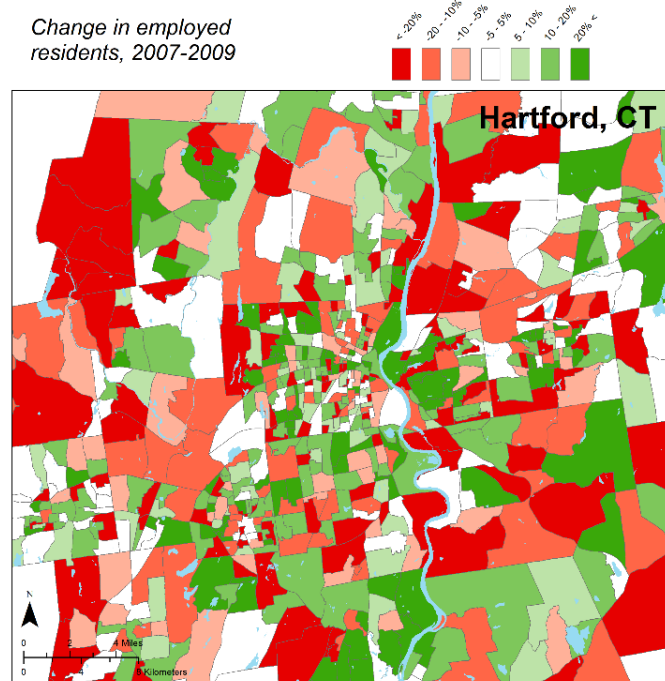


Figure 31: Hartford change in employed residents 2007-2009

urban core of metropolitan areas tended to perform worse almost universally across the study cities. This is a reversal of the trend seen during the recession, with employment now increasing in the suburban periphery and declining in city cores. The trend is evident in the examples of Hartford (Figure 32), Las Vegas (Figure 33), and Boise (Figure 34). The period from

2012 to 2015 was characterized by widespread employment growth. Employment increased across all of the metropolitan areas, in both suburban and core areas (e.g. Fresno, Figure 35).

In order to get an overall picture of the recession's impact and the long-term recovery progress, the change in employment between 2007 and

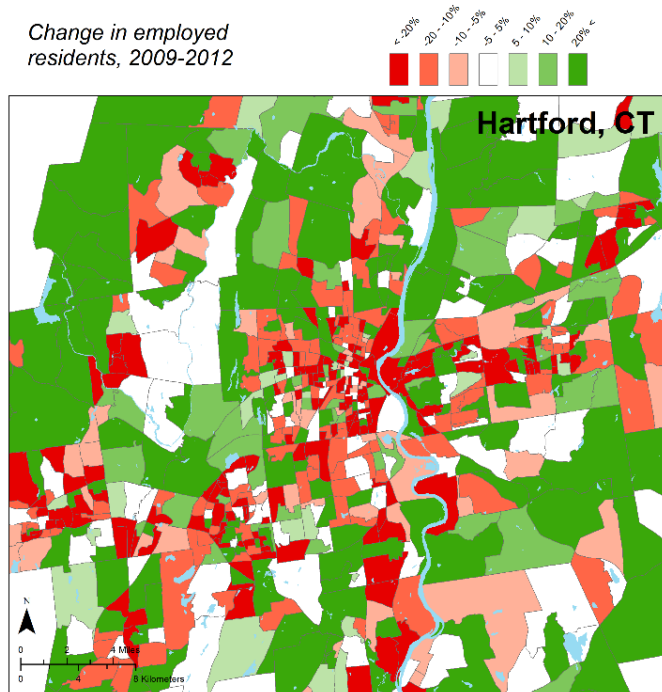


Figure 32: Hartford change in employed residents 2009-2012

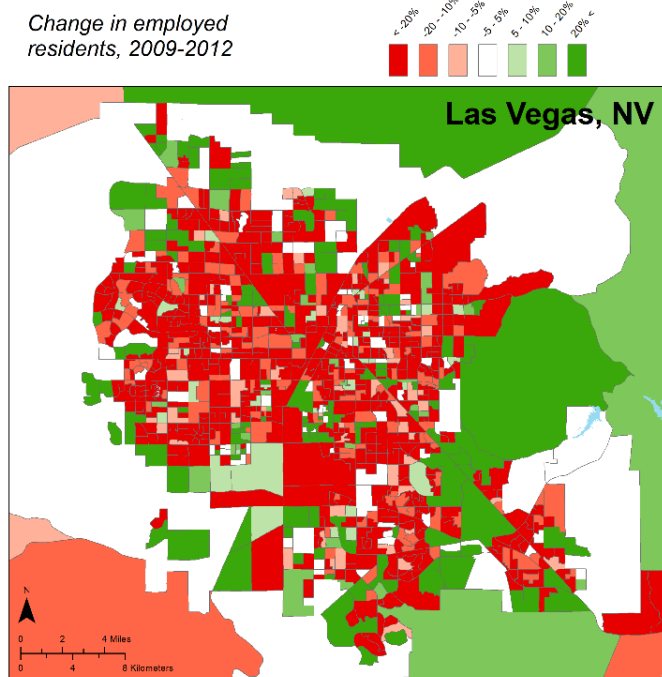


Figure 33: Las Vegas change in employed residents 2009-2012

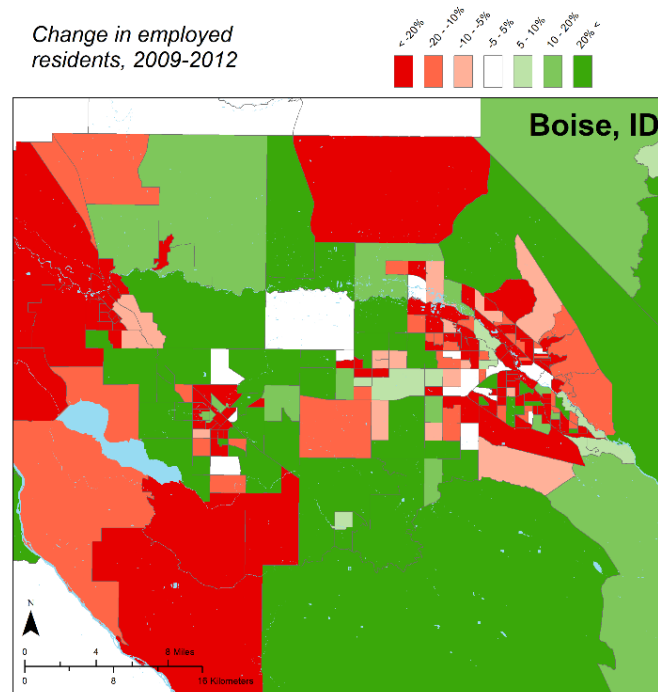


Figure 34: Boise change in employed residents 2009-2012

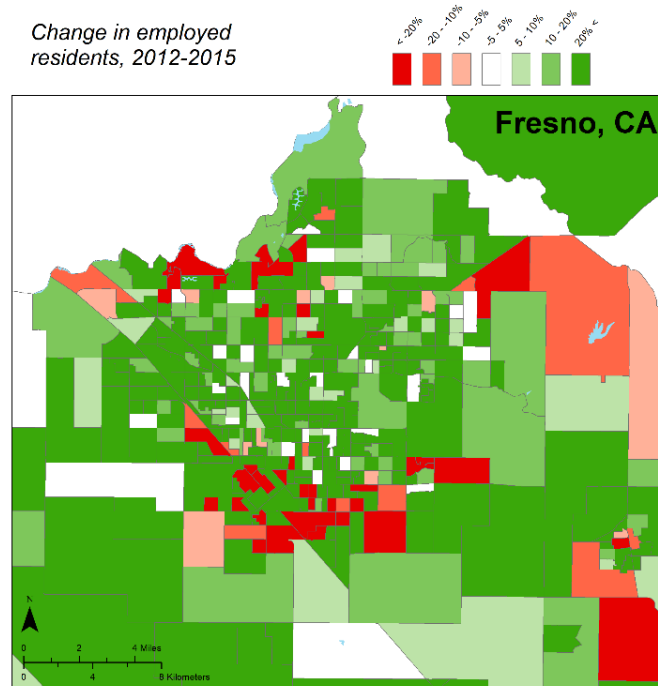


Figure 35: Fresno change in employed residents 2012-2015

2015 was mapped as well. Some metropolitan areas showed a mix of employment gains and losses with no discernable spatial pattern, such as Stockton (Figure 36).

There was, however, a prevailing trend of employment growth out towards the suburbs while city centers generally did poorer. Cape Coral (Figure 37) and Las Vegas (Figure 38) are two examples of this pattern, with large portions of their city centers seeing a decline in employed population since the start of the recession, and increases in employed population largely occurring around the periphery of the metropolitan area.

A slight variation of this trend is present in Phoenix (Figure 39) and Detroit (Figure 40). These two cities also show the

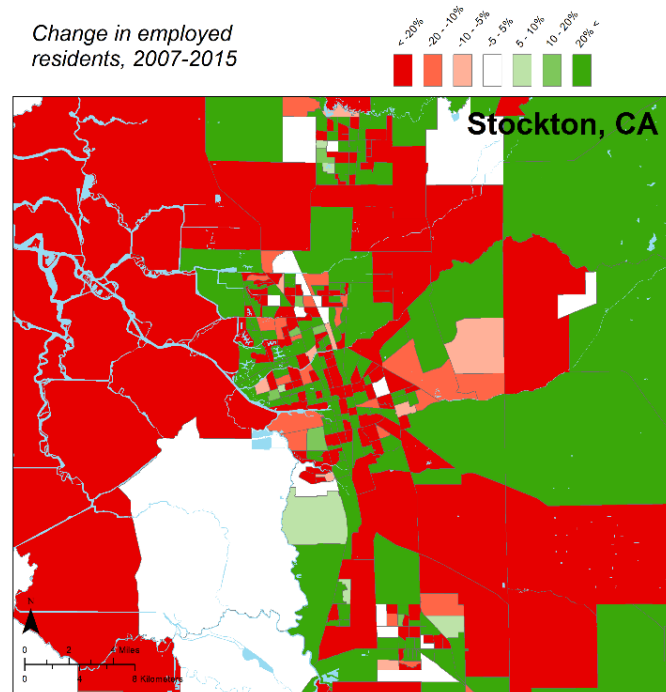


Figure 36: Stockton change in employed residents 2007-2015

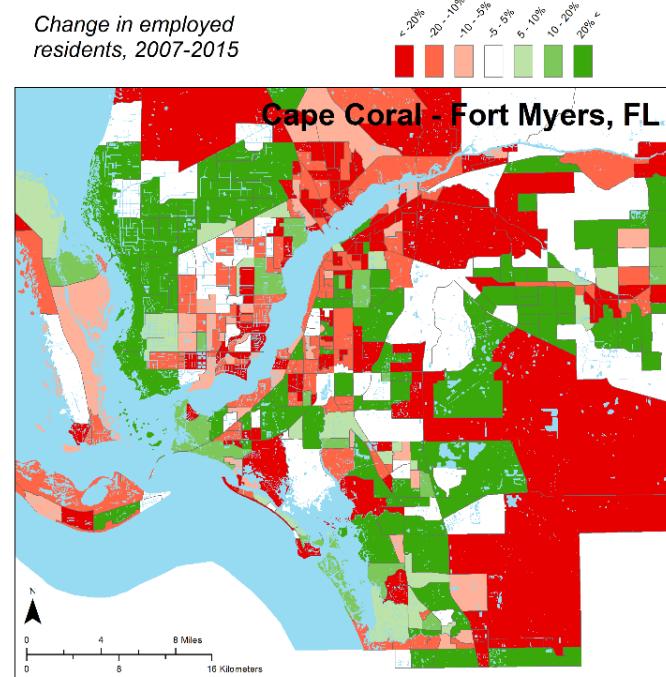


Figure 37: Cape Coral change in employed residents 2007-2015

employment increase in the outer suburbs and decrease in the city core, but within the city core they also have a cluster of employment growth around their downtown area. The fact that these two metropolitan areas are the two most populous that were included in the study by a large margin (Table 1) suggests that they may have been the only cities with downtowns that were substantive and economically powerful enough to counteract the job loss caused by the Great Recession.

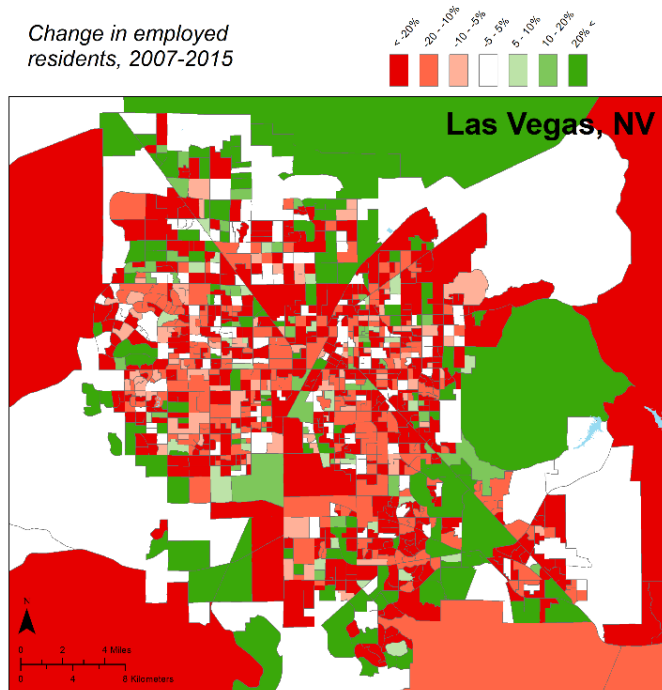


Figure 38: Las Vegas change in employed residents 2007-2015

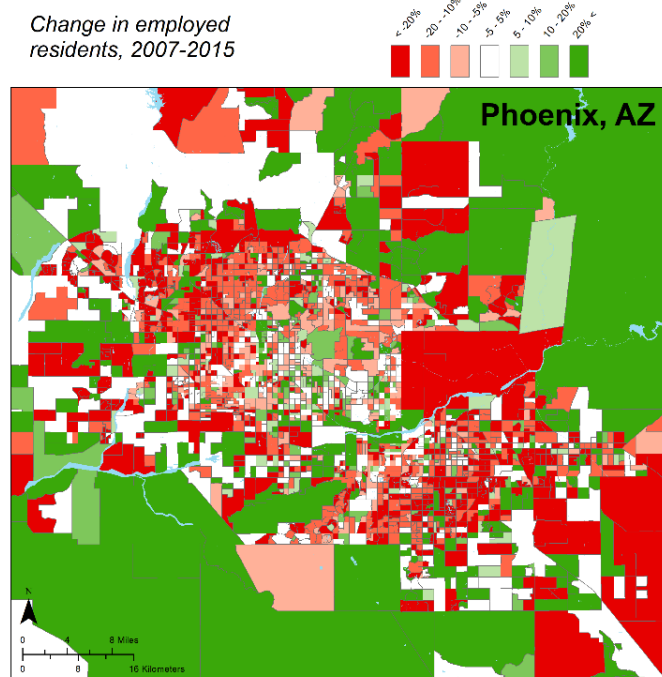


Figure 39: Phoenix change in employed residents 2007-2015

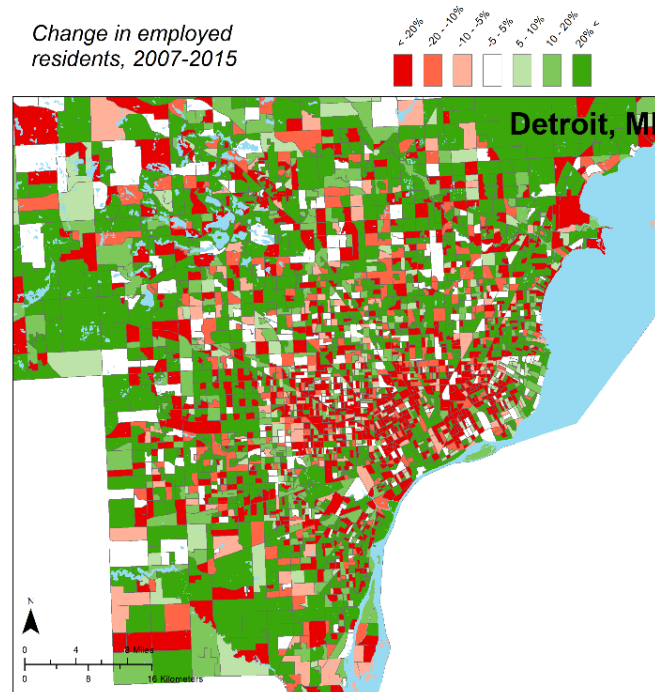


Figure 40: Detroit change in employed residents 2007-2015

Recession and Recovery Trajectory

Looking at the categorical trajectories of employment in the recession and recovery (Appendix B), there are less defined similarities within metropolitan areas. However, all ten have a significant number of census block groups that have not returned to pre-recession employment levels. Even the metropolitan area that ended up the furthest ahead by 2015, Charlotte, shows a smattering of sizeable areas that remain below 2007 employment levels (Figure 41), despite its dominant trend of full recovery by 2012. This is also true for Cape Coral, which exhibits a more distinct pattern with much of the urban core yet to fully recover from recession losses, while the more suburban areas tend to have recovered by 2012 (Figure 42). The incomplete recovery in a city's core is also evident in Las Vegas (Figure 43). However, Las Vegas differs in its greater proportion of

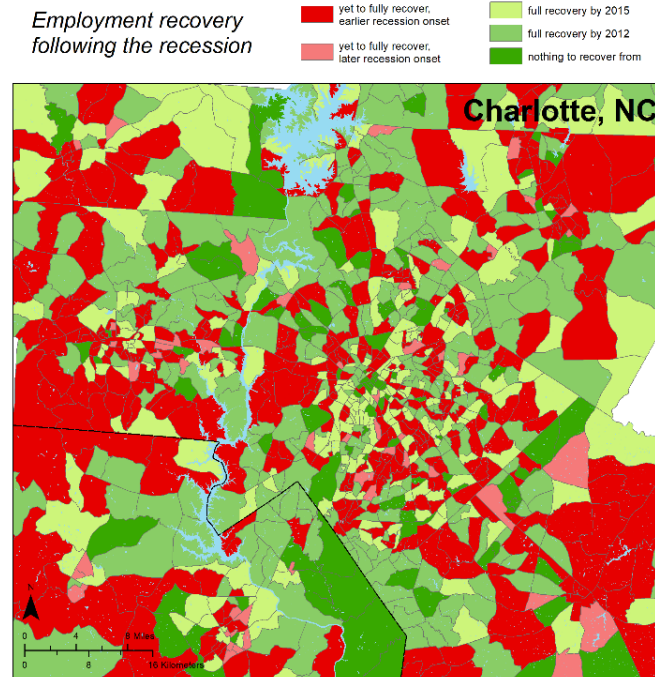


Figure 41: Charlotte employment recovery following the recession

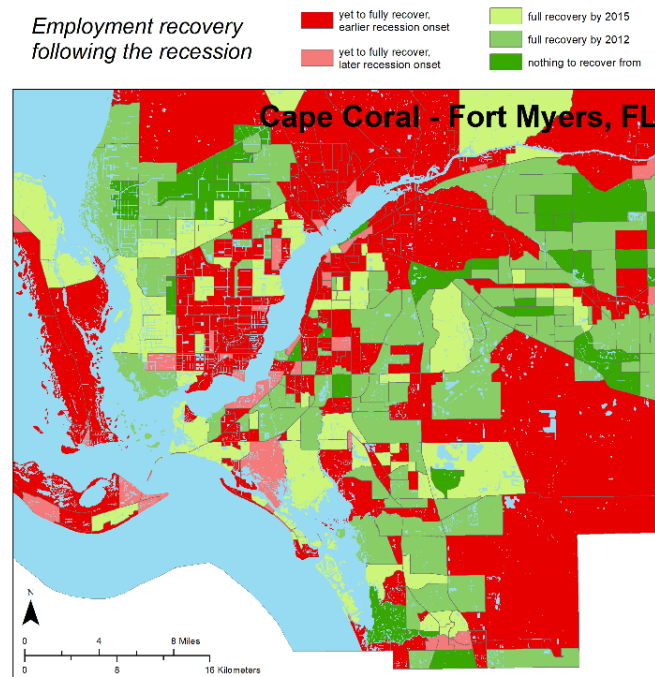


Figure 42: Cape Coral employment recovery following the recession

late onset areas, where the decline in employment only came after 2009. Phoenix also demonstrates the pattern of later onset losses in the core of the metropolitan area, with more recovery in the city's periphery (Figure 44). Where Phoenix varies is in the stronger recovery in and around its downtown area. Similarly, Detroit's downtown area performed well during and after the recession, but much of the rest of the urban core is still yet to fully recover (Figure 45). Beyond that, out into the suburbs, there has been more successful recovery, mostly by 2015.

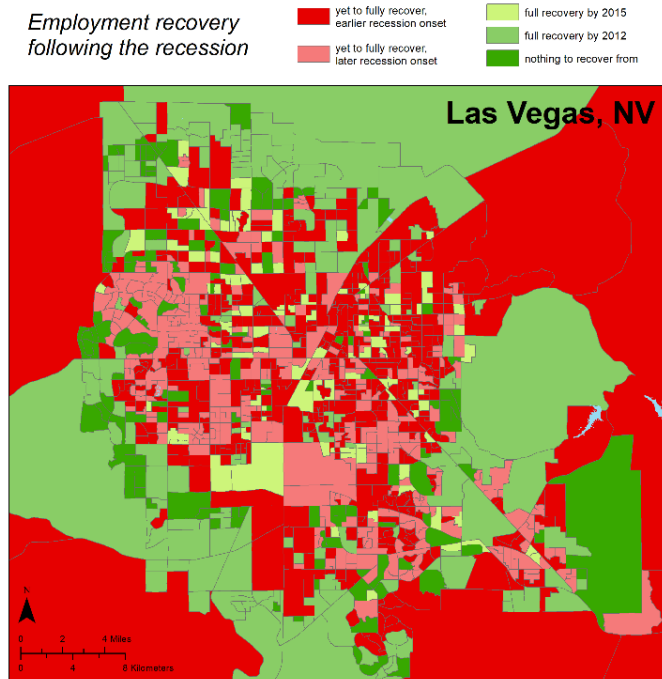


Figure 43: Las Vegas employment recovery following the recession

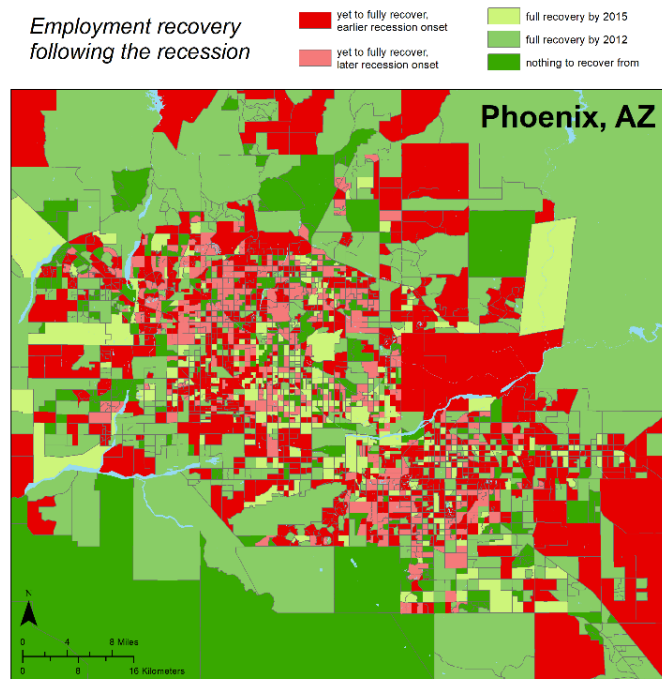


Figure 44: Phoenix employment recovery following the recession

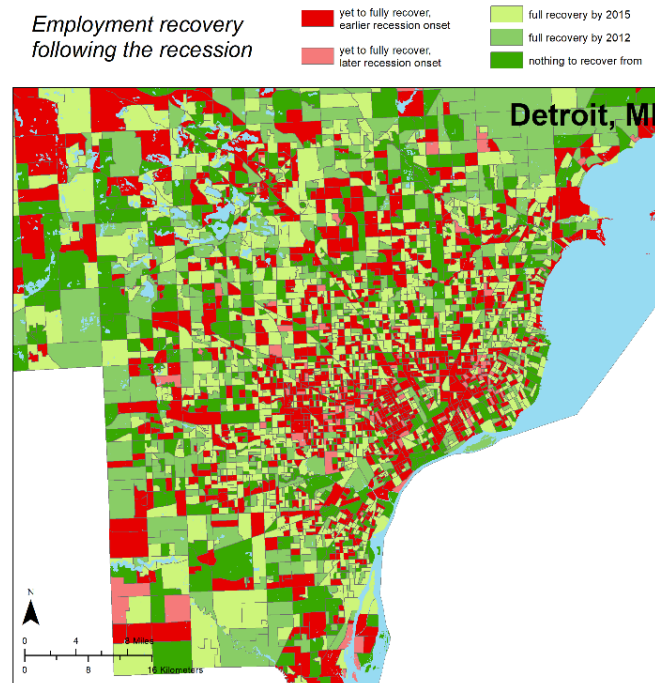


Figure 45: Detroit employment recovery and following the recession

Age

The different socioeconomic characteristics exhibited intra-metropolitan area spatial patterns as well, which were often, but not always, reflective of the overall patterns of employment change during and after the recession. Considering age (Appendix C), employment loss among residents aged 29 and younger was widespread across almost all of the metropolitan areas during the recession (e.g. Boise, Figure 46). Where variation in the degree of employment loss existed, it tended to be less severe in the core of metropolitan areas. For example, employment loss among younger residents in Phoenix was widespread across the metropolitan area, but appears to be less severe in the city center (Figure 47).

Spatially, the middle-aged group showed variation in employment change during the recession. Similar to the younger group, employment loss was widespread across some of the metropolitan areas; however, the losses were less severe than for the younger group. Other metropolitan areas had more of a mix of employment losses and gains for those aged 30 to 54. That mix was often stratified, with losses concentrated around the periphery and gains in the core of the city. In Charlotte, for example, employment among middle-aged residents can be seen to have declined around the outer edge of the metropolitan area while gains were experienced in the center of the city (Figure 48).

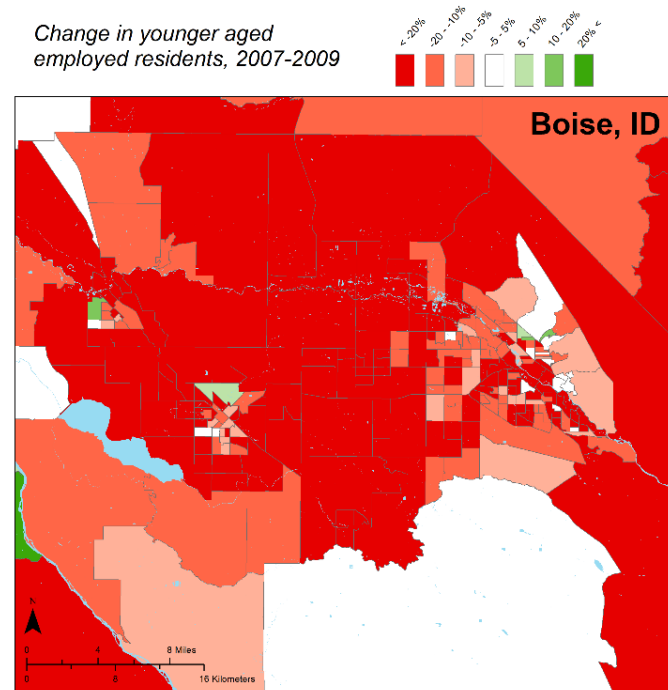


Figure 46: Boise change in younger aged employed residents 2007-2009

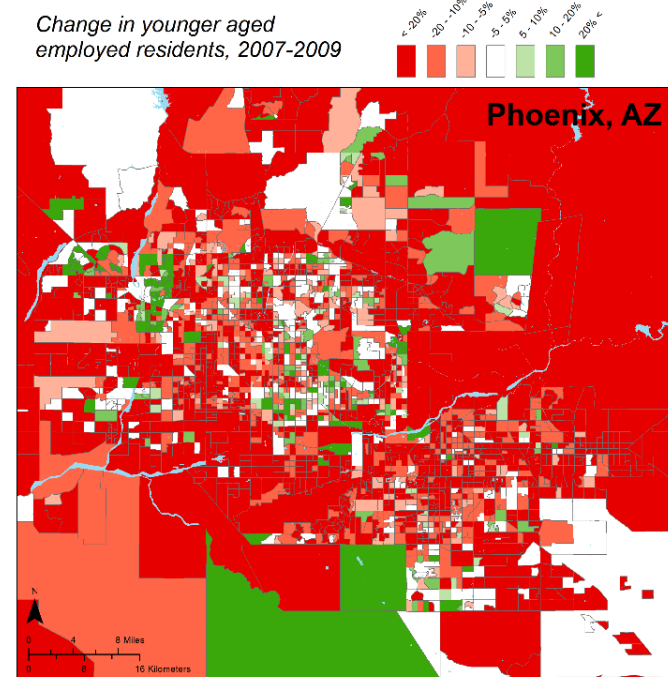


Figure 47: Phoenix change in younger aged employed residents 2007-2009

The older group, ages 55 and up, exhibited varied patterns of employment change during the recession. There was a mix of employment gains and losses within most metropolitan areas, but a consistent pattern was lacking. In some cities, such as Jacksonville (Figure 49), there seemed to be a greater concentration of employment losses in the core versus the suburbs, but in others, such as Boise (Figure 50), that pattern appeared reversed with more employment gains in the core than in the suburbs.

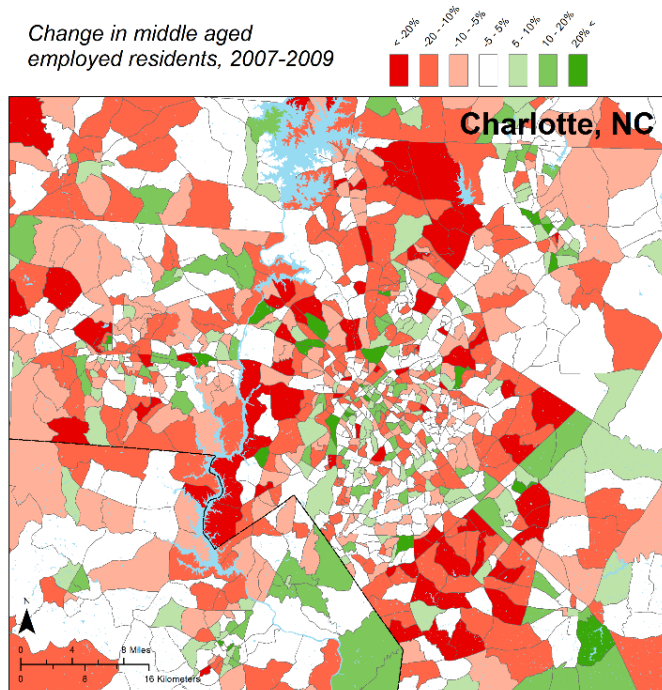


Figure 48: Charlotte change in middle aged employed residents 2007-2009

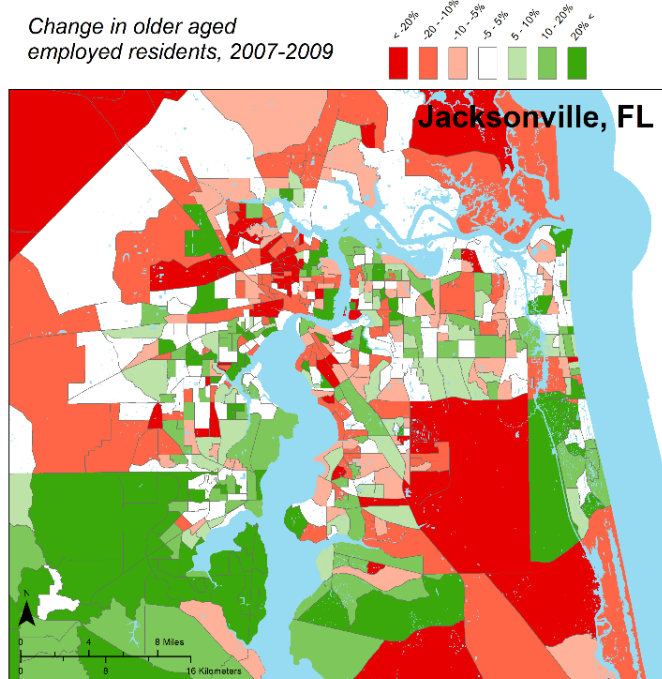


Figure 49: Jacksonville change in older aged employed residents 2007-2009

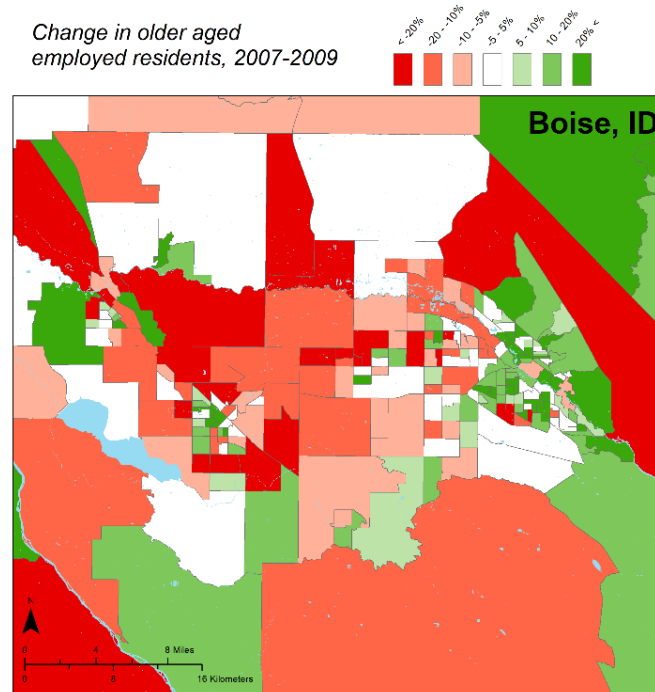


Figure 50: Boise change in older aged employed residents 2007-2009

Income

Spatial patterns of employment change within metropolitan areas were evident among the different income categories as well (Appendix D). Most metropolitan areas experienced a significant degree of employment loss during the recession for the lower and medium income categories. In fact, these two categories often appeared strikingly similar, with the decline in medium income employed residents being slightly less severe in most cases. The losses occurred across entire metropolitan areas for the most part, as is evident in the example of Charlotte (Figure 51 and Figure 52). While a majority of cities lacked a clear spatial trend, a few showed greater employment loss around their periphery than in their core, Boise (Figure 53 and Figure 54) being a prime example.

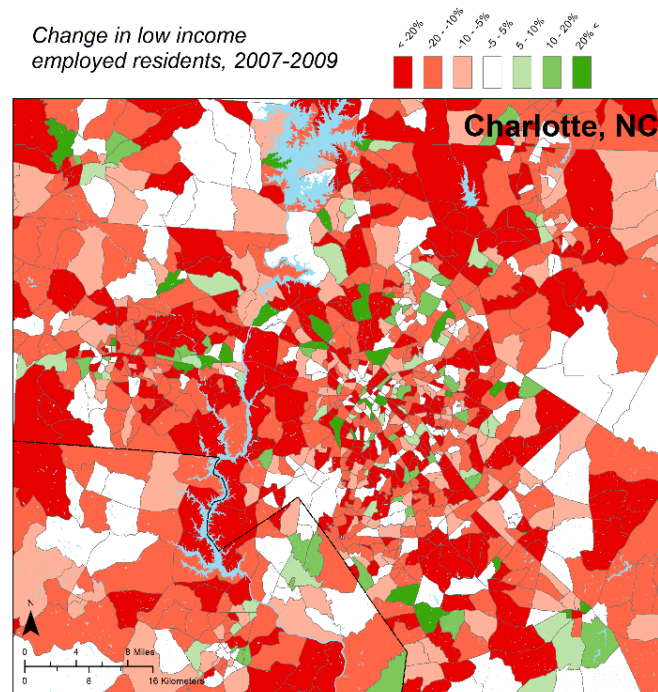


Figure 51: Charlotte change in low income employed residents 2007-2009

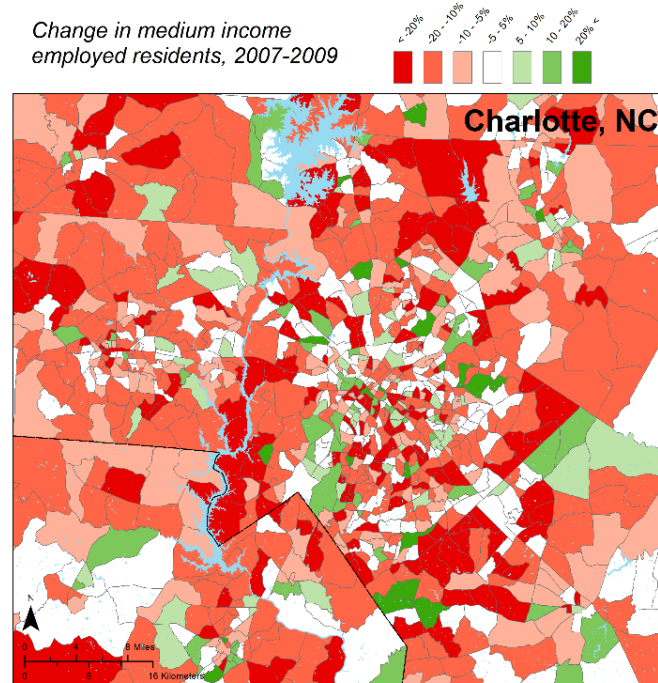


Figure 52: Charlotte change in medium income employed residents 2007-2009

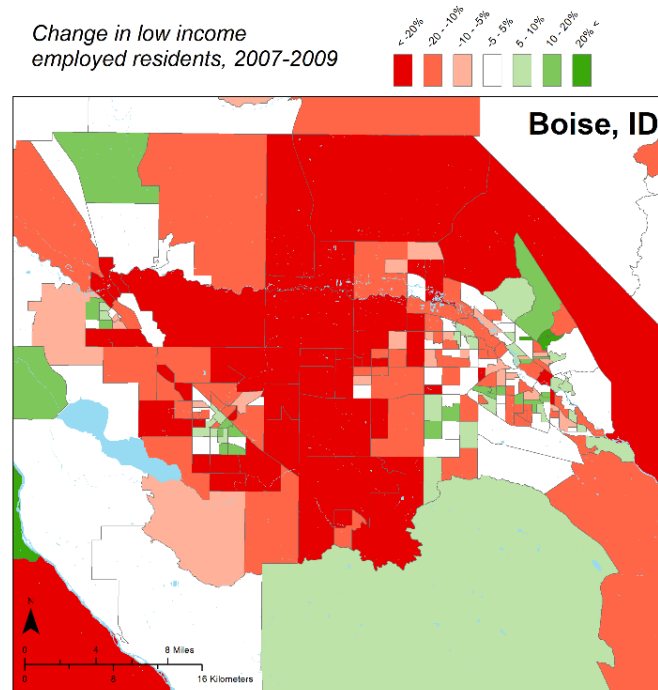


Figure 53: Boise change in low income employed residents 2007-2009

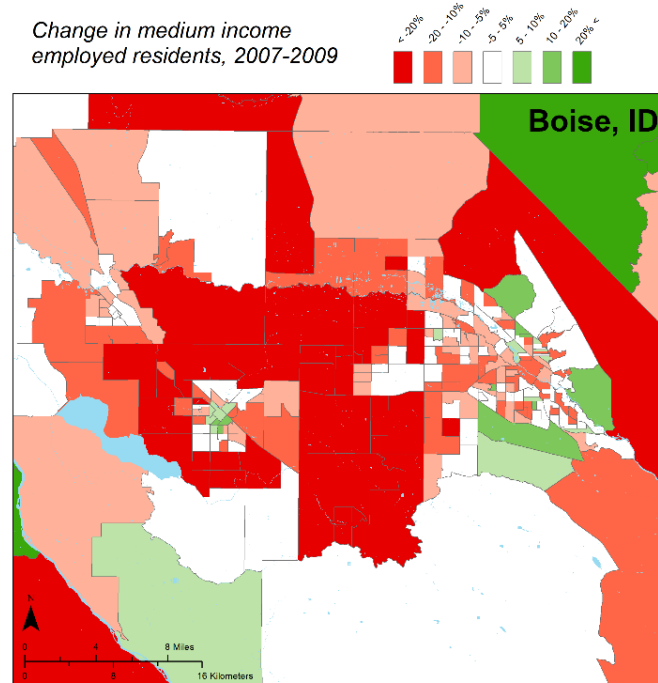


Figure 54: Boise change in medium income employed residents 2007-2009

Looking at the higher income category, there was a lack of overarching trends. The variability within the income group resulted in most cities displaying some mix of employment losses and gains across their metropolitan area during the Great Recession. In some of the cities, like Charlotte (Figure 55: Charlotte change in high income employed residents 2007-2009), Fresno, and Phoenix, a pattern of employment gain or more minimal employment loss in the core of the metropolitan area with greater losses around the periphery was evident. In contrast, there were also a number of cities, like Boise (Figure 56), Cape Coral, and Detroit, where the inverse was true, with greater employment loss concentrated in the core areas.

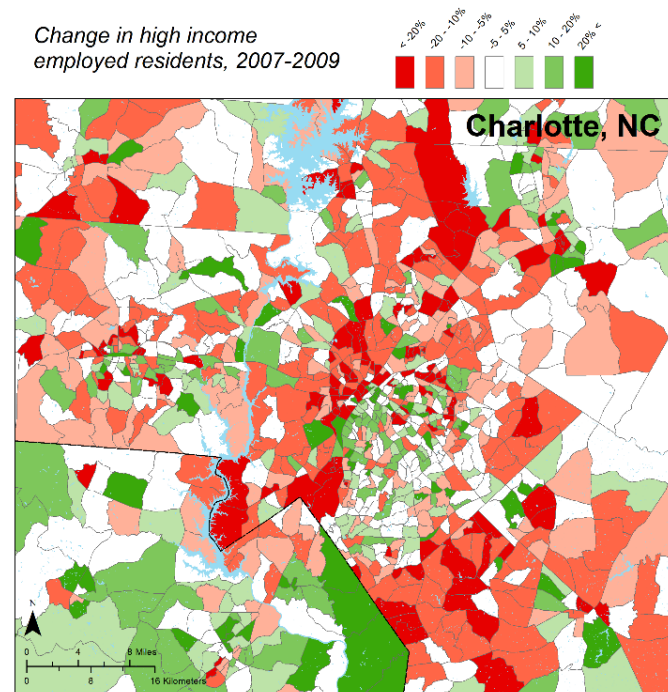


Figure 55: Charlotte change in high income employed residents 2007-2009

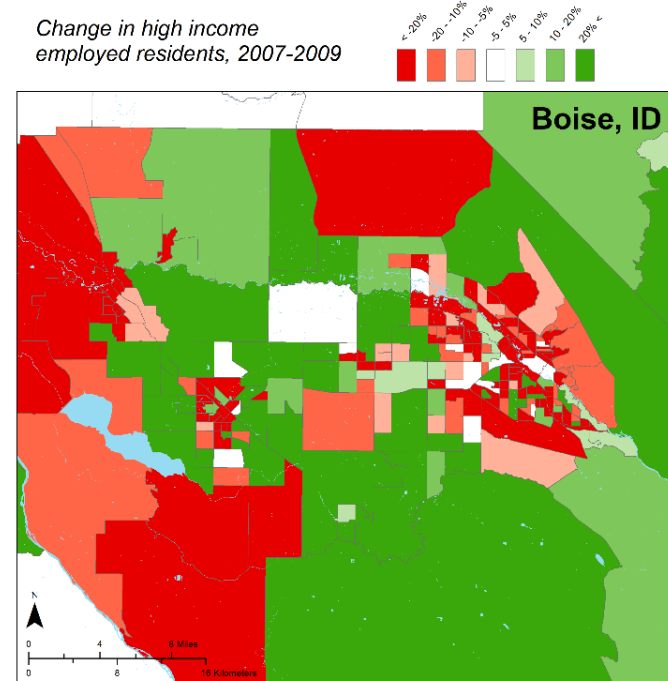


Figure 56: Boise change in high income employed residents 2007-2009

Industry

The five industry categories were assessed for intra-metropolitan patterns as well (Appendix E). Due to the very small size of the primary industry in most of the metropolitan areas, many had a large number of census block groups with zero residents employed in the primary industry. This prevented the assessment of any further spatial trends for primary industry employment change.

The secondary industry saw the greatest decline in the number of employed residents during the recession, but there was not a clear spatial trend to the change in employment. There was simply widespread decline across most of the study cities, such as Las Vegas, where employment loss occurred throughout the metropolitan area (Figure 57). The few cities with less severe declines in secondary employment, like Hartford, had areas of employment growth scattered among the losses throughout their metropolitan area (Figure 58).

When considering the professional industry category, the most consistent trend between the metropolitan areas was an increase in the number of employed residents or more minimal decrease in the city centers during the

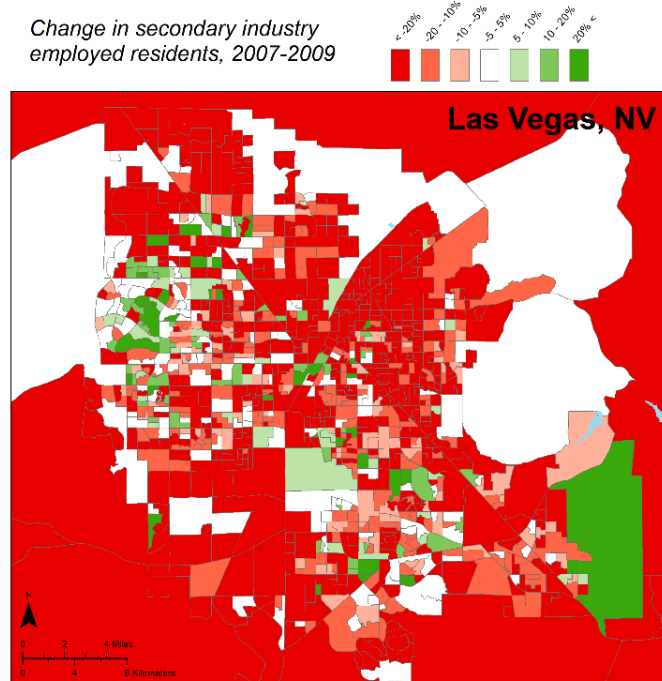


Figure 57: Las Vegas change in secondary industry employed residents 2007-2009

recession. This was evident in a handful of cities, including Boise (Figure 59). Other metropolitan areas were either dominated by widespread decline in professional industry employed residents (e.g. Jacksonville, Figure 60), or exhibited scattered gains mixed amongst the losses.

The retail industry category followed a very similar trajectory during and after the recession to the professional industry category. However, they differed in their spatial trends, with the retail industry lacking the more defined trends displayed by the professional category. For the retail industry, most cities showed a mix of employment gains and losses in varying proportions scattered with

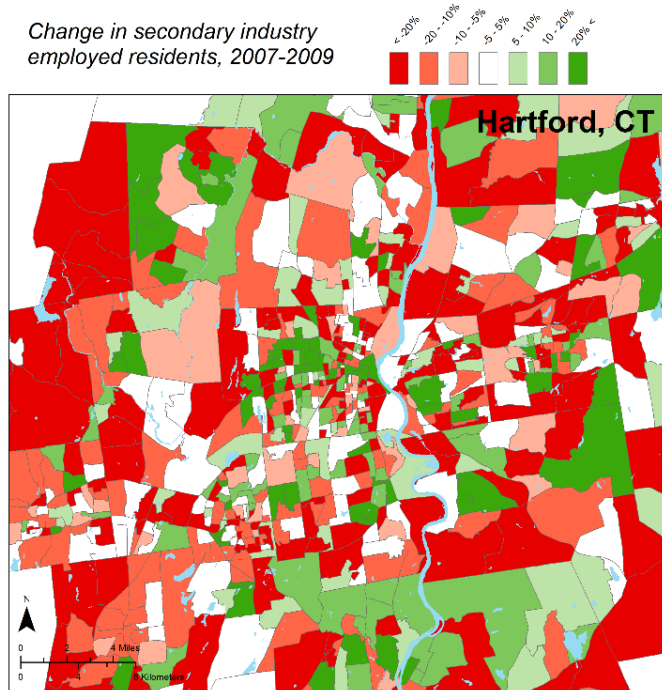


Figure 58: Hartford change in secondary industry employed residents 2007-2009

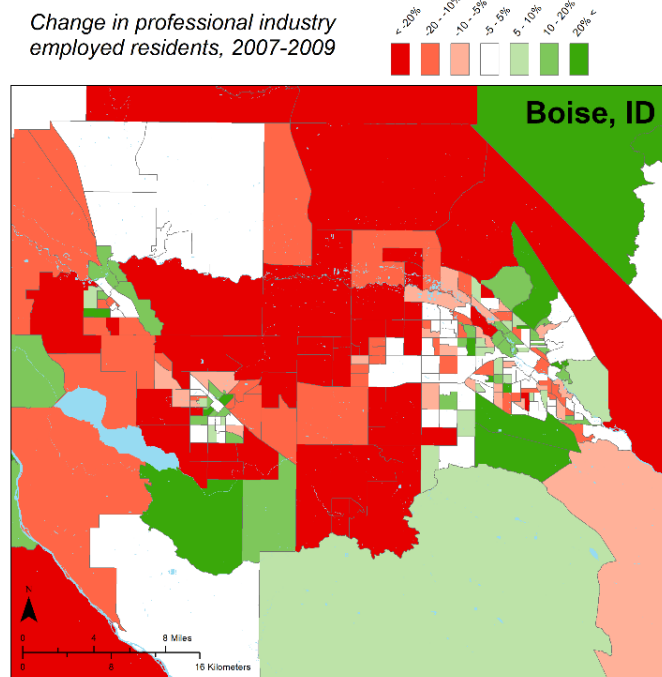


Figure 59: Boise change in professional industry employed residents 2007-2009

little spatial pattern, similar to what is seen with Fresno (Figure 61).

Spatially, there appeared to be public industry employment growth across most metropolitan areas, with a tendency toward employment losses only occurring around the periphery. This pattern is not present in all of the cities, like in Charlotte where there was significant growth in the outer reaches of the metropolitan area (Figure 62). Phoenix demonstrates the trend clearly though, with strong public industry employment growth throughout the metropolitan area and the few areas of employment loss mostly found in peripheral areas (Figure 63).

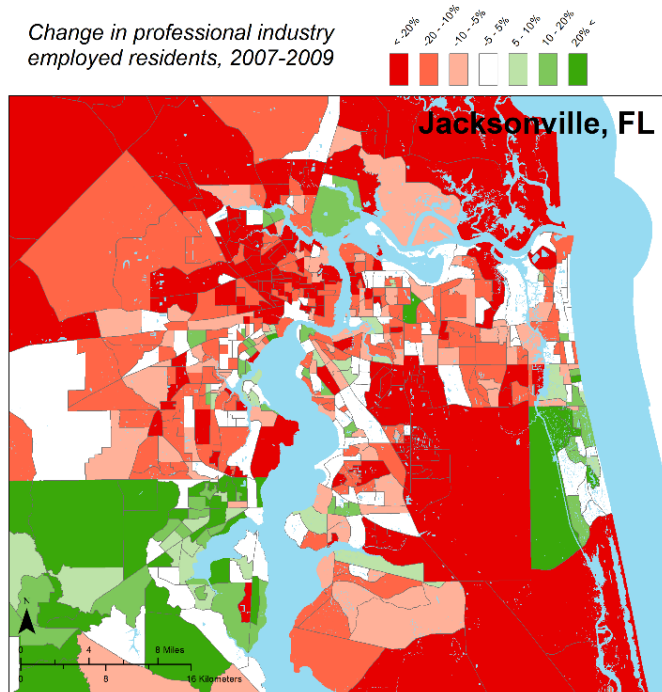


Figure 60: Jacksonville change in professional industry employed residents 2007-2009

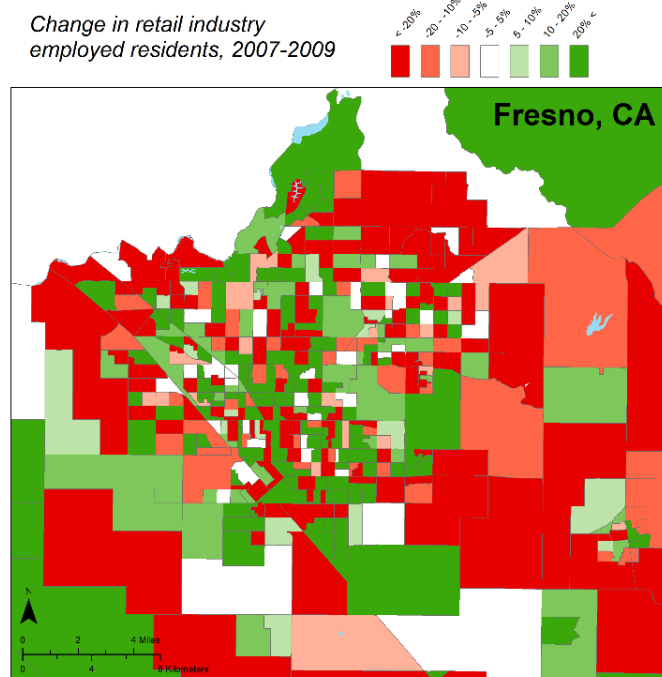


Figure 61: Fresno change in retail industry employed residents 2007-2009

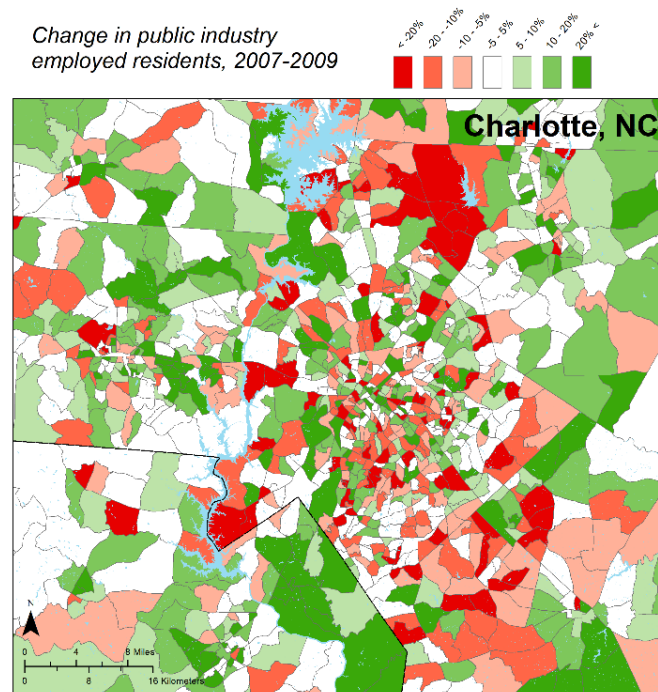


Figure 62: Charlotte change in public industry
employed residents 2007-2009

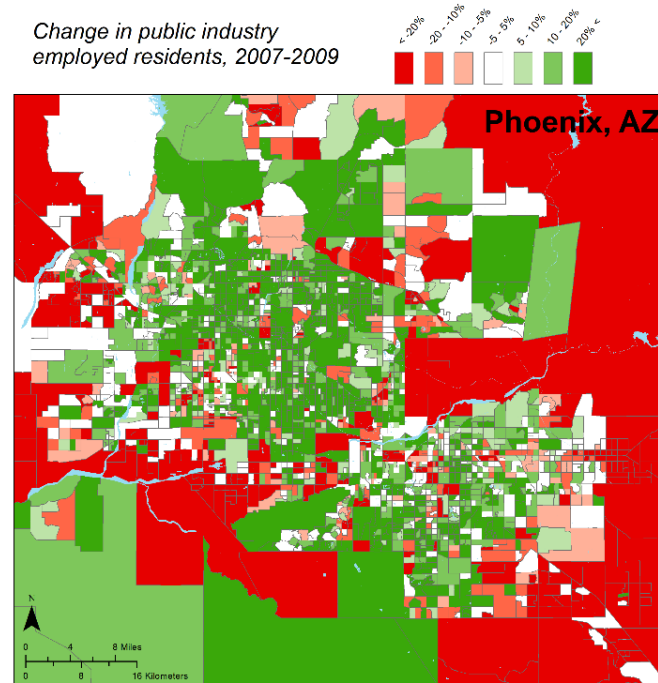


Figure 63: Phoenix change in public industry
employed residents 2007-2009

CHAPTER V

DISCUSSION

Inter-Metropolitan Area Patterns

General trends in overall employment change, and change by age, income, and industry have been explored, giving useful insight into the ways in which different people and different locations were impacted by job loss during the recession. Comparison of the metropolitan areas shows that the trajectories of employment do not exhibit any definitive patterns by region or city size. Regionally, Sunbelt cities were among the worst performers, with Las Vegas, Phoenix, and Jacksonville experiencing deep and prolonged employment loss. However, other Sunbelt cities revealed different trends, with Fresno being one of only two cities to recover their employment losses by 2012, and Cape Coral experiencing the greatest post-recession growth.

There were also no discernable trends by city size. The metropolitan areas with the greatest percent decrease in employment during the recession included both larger centers such as Las Vegas and Phoenix, and smaller ones like Cape Coral and Boise. Similarly, the cities that experienced the highest rate of employment recovery included larger cities like Charlotte and smaller ones like Cape Coral. As regional trends have been identified elsewhere in the literature (Kneebone 2010; Kuehn 2011), the lack of regional and size trends may be due to the relatively small selection of study cities. Analyzing a more comprehensive set of metropolitan areas with a substantial number

from each region and of various sizes, rather than a hand-selected few from each, would be more likely to reveal any patterns that may exist.

Where the size of metropolitan areas did seem to make a difference was in the spatial trends. Larger metropolitan areas lent themselves better to identification of spatial patterns of employment change. This may be due to the greater number of census block groups in larger metropolitan areas, which provides more opportunity for clusters of employment growth or loss to form, thus making patterns more apparent. It may also be due in part to the subjectivity of the process, as trends were identified visually.

Broad trends in employment change were exhibited by the different demographic categories during the recession and recovery. The younger age category experienced the greatest employment losses and has had a prolonged recovery, while the older age category experienced minimal job loss during the recession, even gaining in some cities. This allowed a quick recovery by 2012, and since then the older age employed population has only continued to increase. Among the income categories, the lower income and the medium income categories have struggled to recover from employment losses during the recession, while the higher income category has seen a high rate of growth post-recession. The relative struggles of younger and lower income workers during the recession could be a function of more limited work experience or job skills, which would make acquiring new employment more difficult during a time of economic crisis.

Existing literature on the recession shows that greater employment loss occurred in areas with higher poverty rates (Kneebone and Holmes 2015), and lower skilled workers tend to be more vulnerable to economic shocks (Rothstein 2014). This supports

our finding that lower income employed residents saw the greatest proportional decrease. The robust post-recession growth of higher income employment is a positive economic indicator for metropolitan areas, as it bolsters the local wealth base. However, the stagnation of lower income employment is still concerning. Many of those who lost lower wage jobs may not have the skills or experience necessary to attain a higher wage job, so the decline in suitable employment opportunities for them does not bode well. Likewise, the struggles of the younger age group are worrying. Not only is the number of employed young people stagnating, but research suggests that young people entering the labor market during a recession see diminished earnings long term (Oreopoulos, von Wachter, and Heis 2012).

Among the job industry categories that were analyzed, the public industry (including fields like healthcare, education, and public administration) performed the best, experiencing an increase in employment totals during the recession, which only continued growing post-recession. The secondary industry category (including fields like construction, manufacturing, and transportation) was at the other end of the spectrum, experiencing a substantial decrease in total employment during the recession and remaining below pre-recession levels throughout the recovery period.

These results are in agreement with trends previously identified in the literature. Education and health are noted as two job sectors that have seen some of the strongest growth since the onset of the recession (Rothstein 2014), which confirms the robust growth in primary industry employment observed in the results. These industries are also

less subject to market forces, and may have benefitted from government stimulus programs such as the American Recovery and Reinvestment Act of 2009.

Additionally, construction and manufacturing have been identified as two of the industries with the greatest recession job losses (Elsby, Hobijn, and Sahin 2010; Rothstein 2014), explaining the staggering losses seen by the secondary industry category. The secondary industry struggles are related to the collapse of the housing market, which coincided with the Great Recession. The housing boom that had been occurring pre-recession came to a screeching halt, and the resulting loss of construction jobs makes the significant secondary industry employment decline understandable. This also helps explain the difficulty of metropolitan areas to recover their secondary industry losses. Looking at the period from 2004 to 2007, major employment increases in the secondary industry occurred in most of the cities. It has been suggested that the housing boom and the illusory economic growth that came with it, such as construction jobs, were unsustainable (Gabe and Florida 2013). Therefore, recovering to the inflated 2007 level of employment may not be attainable under normal economic conditions and may not be necessary for a successful recovery.

Variability between metropolitan areas was noticed in their differing recoveries following the recession. The general trend was that of a longer term but eventually successful recovery, bolstered by strong employment growth in the older age, higher income, and public industry demographics. Hartford and Detroit stick out as two metropolitan areas with more abnormal post-recession trajectories. Both cities experienced minimal rebound or continued decline in the number of employed residents

categorized as young or middle aged, and lower or medium income (Figure 64 and Figure 65). Overall, they were still able to recover to pre-recession employment levels though, thanks to very strong growth in the number of older aged and higher income employed residents. In other cities, these demographics were the strongest performers as well, but they also usually saw a more substantial post-recession recovery in the remaining demographics.

Although all cities experienced a high growth rate of residents employed in the public industry, metropolitan areas also differed in the industries that drove their economic recovery. Las Vegas, for example, has a major tourism industry with a high number of food and accommodation services jobs. As a result, the recovery

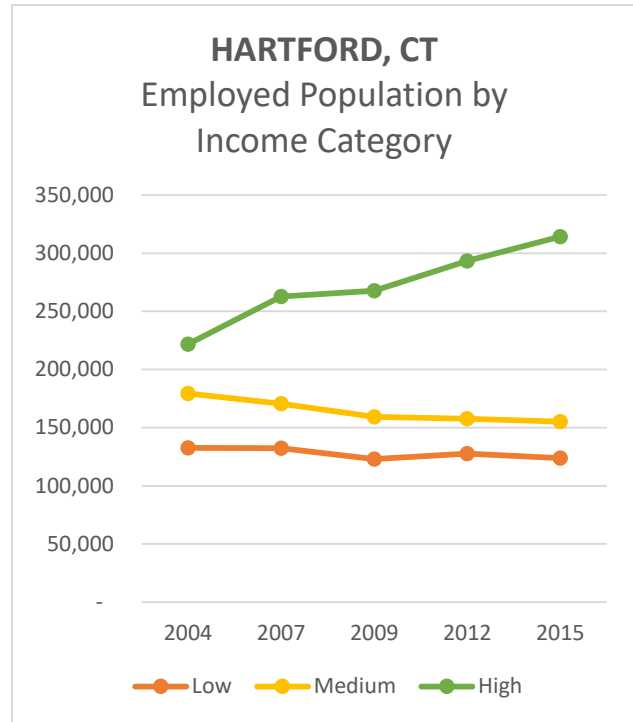


Figure 64: Hartford employed population by income category

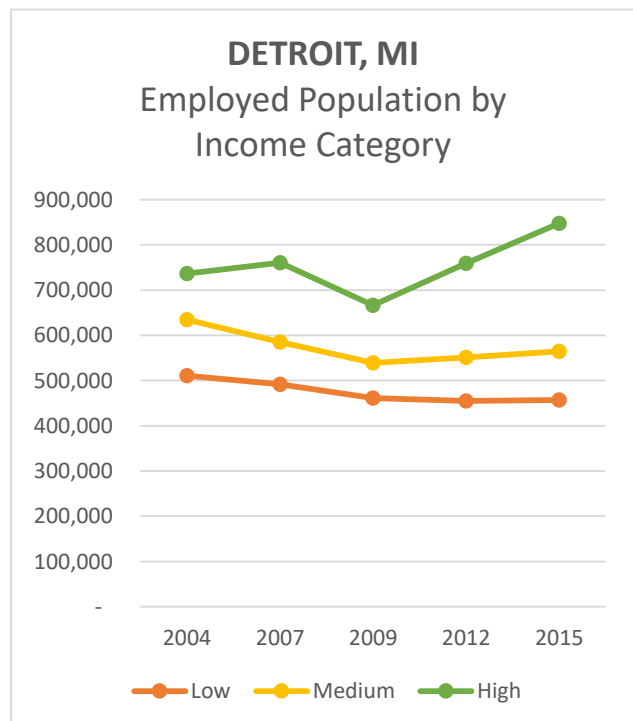


Figure 65: Detroit employed population by income category

of lost employment in the retail industry category was key to their recovery process. The recovery in Detroit was supported in large part by a rapid increase in the number of residents employed in the professional industry. Between 2009 and 2015, there was an increase of over 100,000 residents employed in the professional industry in Detroit's metropolitan area.

Intra-Metropolitan Area Patterns

The results of the analysis revealed patterns of employment change within metropolitan areas as well. There has been a decades long trend of decentralization in cities, with people and jobs moving out of city centers for the suburbs (Kneebone 2013; Kneebone and Holmes 2015). It appears the recession temporarily reversed this process, with greater employment loss occurring around the suburban fringe of metropolitan areas from 2007 to 2009. Following the recession though, the pattern of decentralization returned, with suburban areas recovering quickly and outstripping employment growth in the urban core.

The assessment of intra-metropolitan area patterns of job loss adds another dimension to the study of the recession and its geographically varied effects. Cities that shared very similar overall trajectories may exhibit very different intraurban patterns, and cities that may have differed in their overall trajectories may share similar geographic patterns. Phoenix and Stockton are an example of the first scenario. They exhibited nearly identical employment trajectories from 2007 to 2015, even when broken down by socioeconomic characteristics (e.g. age, Figure 66 and Figure 67), but it was geographically manifested in very different ways. Phoenix had a distinct spatial pattern

with decreasing employment change further from the urban core (Figure 68), while Stockton was merely a mix of strong employment gains and losses throughout both core and suburban areas (Figure 69).

In other cases, metropolitan areas may share similar spatial patterns of employment change while following significantly different trajectories. For example, the spatial patterns of change in the number of employed residents in Las Vegas and Fresno were very similar, particularly in the period from 2009 to 2012 (Figure 70 and Figure 71). Both saw a decline in employment throughout much of their metropolitan areas, with increases largely confined to a ring around the periphery of each city. However, in actuality the number of employed residents in Las Vegas

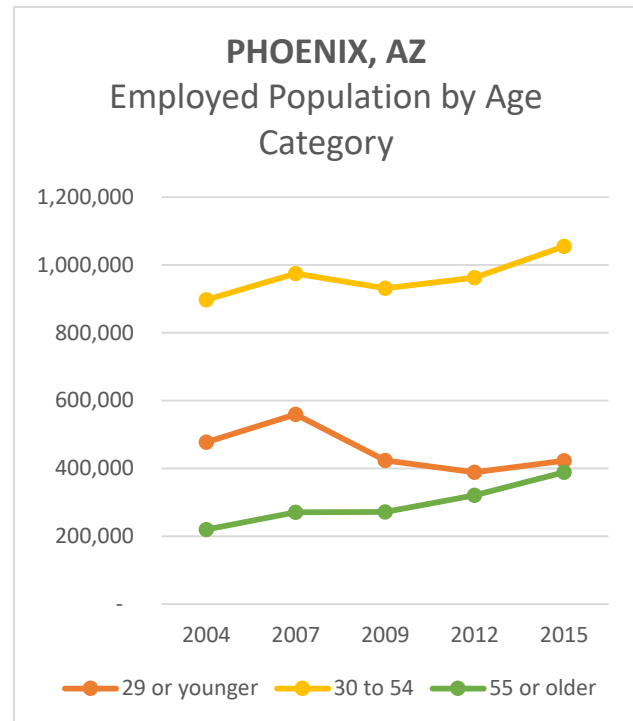


Figure 66: Phoenix employed population by age category

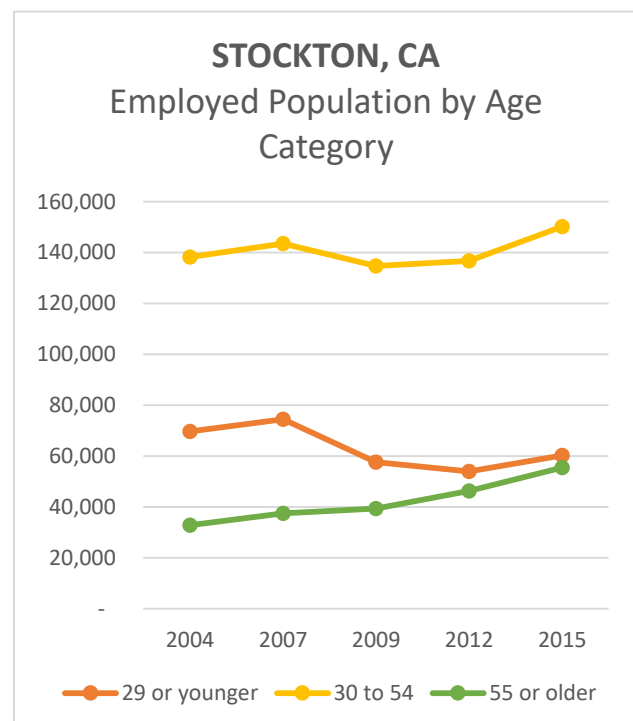


Figure 67: Stockton employed population by age category

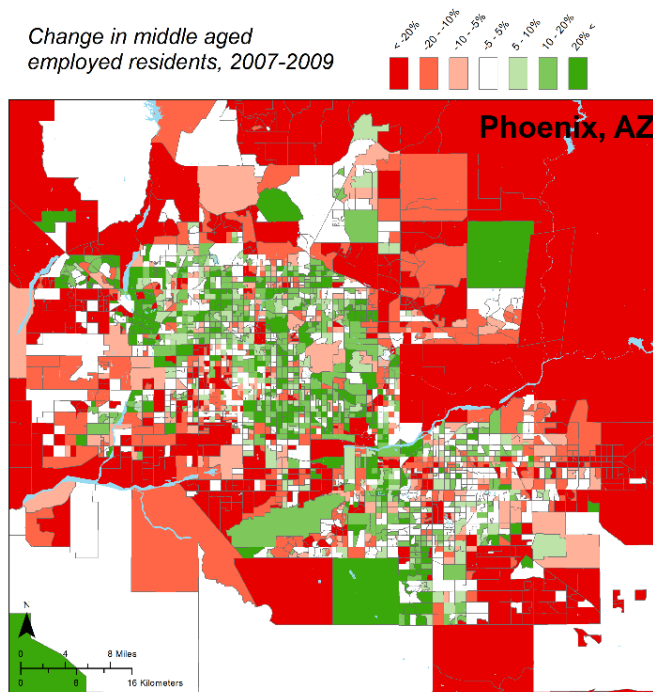


Figure 68: Phoenix change in middle aged
employed residents 2007-2009

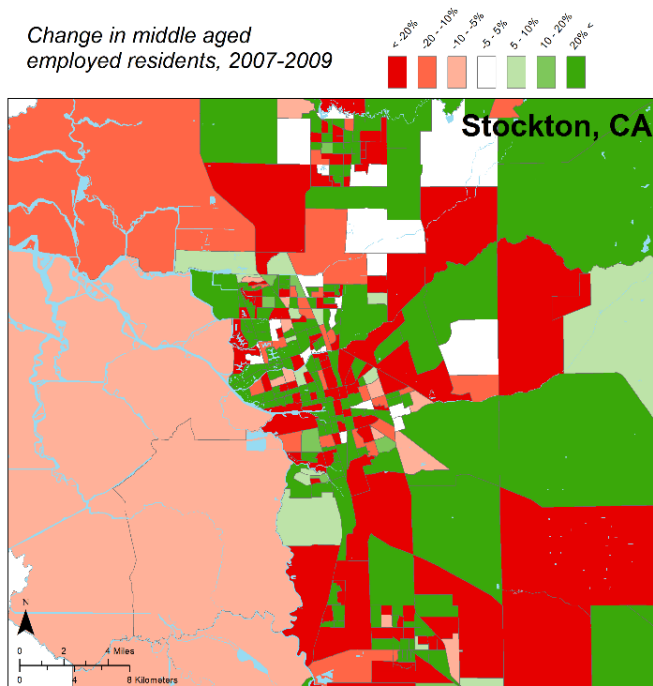


Figure 69: Stockton change in middle aged
employed residents 2007-2009

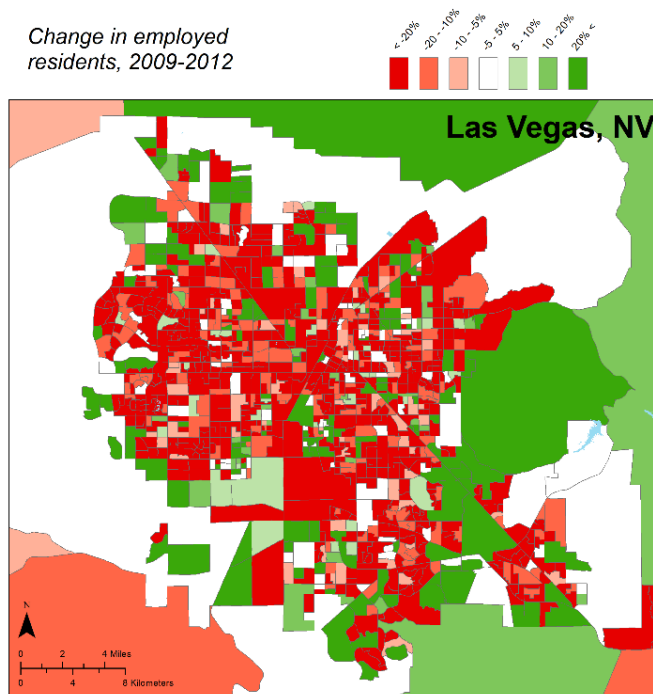


Figure 70: Las Vegas change in employed residents 2009-2012

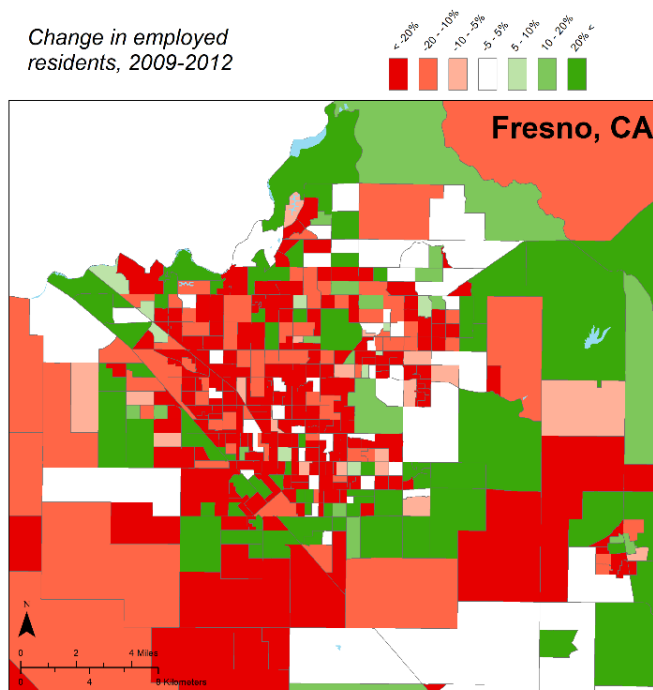


Figure 71: Fresno change in employed residents 2009-2012

decreased by 0.5% during this period, while Fresno was markedly different with an increase of 6.3%.

Furthermore, metropolitan areas may exhibit the same spatial trends, but occurring over different timelines. This is evident when looking at the example of Detroit and Phoenix’s employment trajectories throughout the recession and recovery (Figure 72 and Figure 73). Both are

characterized by recovery of employment in and around their downtown area, employment below pre-recession levels in most of the rest of the urban core, and recovery in the more distant suburban areas. However, the timelines differ between the two cities. In Phoenix, there is a high prevalence of “late onset” areas,

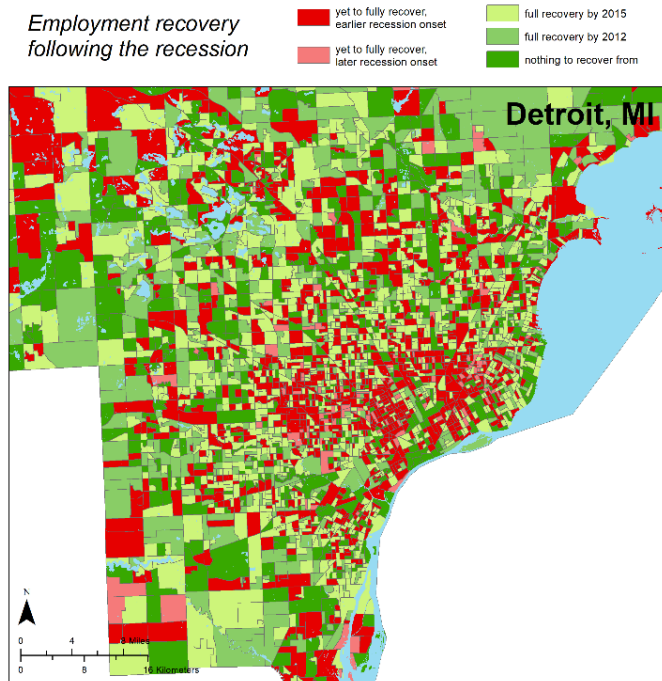


Figure 72: Detroit employment recovery following the recession

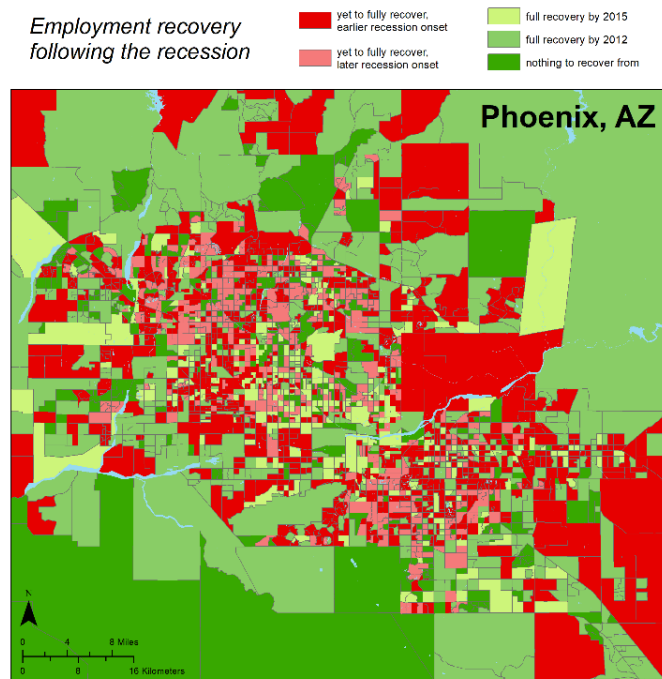


Figure 73: Phoenix employment recovery following the recession

where the number of employed residents only began declining in the 2009 to 2012 period. In Detroit, most areas that remain below pre-recession employment saw their initial decline from 2007 to 2009. Areas that fully recovered in Phoenix mostly did so by 2012 whereas in Detroit a large proportion of areas only did so by 2015. This temporal variance is supported by the literature, with researchers noting differences in the timing and duration of the recession between different cities and regions (Arias, Gascon, and Rapach 2016).

Limitations

When assessing the patterns of employment change, it should be noted that the dataset simply tracks the number of employed residents per census block. It is unknown whether a change in the number of employed residents translates to an increase or decrease in the percentage of the residents who are employed. An attempt was made to address this issue, but annual population data is unavailable at the census block scale.

In addition, the data does not state whether jobs were gained or lost, only how many residents were employed. A change in the number of employed residents could therefore be due in part to migration to or from an area. While it has been noted that the rate of migration within the United States significantly declined during the recession (Karahana and Rhee 2013), this may have still had an effect on the resultant trends. Most new development in metropolitan areas occurs in suburban and fringe areas, so those areas will naturally see the greatest influx of people. This influx could have played a part in the strong post-recession employment growth in the suburbs. It is important to consider the effect that new people moving into these areas may have had, however that effect

could still be a reflection of the economic state of a location, with an influx of employed residents indicative of an economic improvement.

Another limitation is the demographic shifts that may have occurred over time within the socioeconomic factors that were considered. The percentage of residents in a certain age group who are employed is unknown; employment trends can only be inferred from the total number of employed people in an age group. An increase or decrease in the number of employed residents within a certain age group may be partially attributable to overall increases or decreases in the number of people in that age group. For example, if the population of an area were skewing older, it would make sense that the number of employed older residents would increase more quickly as that sector of the population grows.

The assessment of spatial trends of employment change relied upon visual inspection. This subjective approach is vulnerable to inaccuracies. In the future, a more objective measure could be developed to more definitively discern spatial patterns of employment change within metropolitan areas. Scholars have previously addressed this issue by comparing data values for an area against its distance from the city center (Kneebone 2013; Walker 2016).

It is difficult to determining spatial patterns of employment within metropolitan areas in greater detail without local knowledge of each metropolitan area that was studied. Acquiring a better understanding of a city's neighborhoods and characteristics may allow more subtle and specific trends to be identified, but such an in depth analysis would be very labor intensive. This study sought to attain a balance whereby a variety of

cities could be assessed in order to find any overarching patterns, while providing enough detail so that those patterns could include intraurban trends.

CHAPTER VI

CONCLUSION

The Great Recession was the worst economic downturn since the Great Depression, and it brought with it significant job losses across the United States. Employment had a prolonged recovery, with high unemployment rates persisting for years after the recession (Rothstein 2014). While unemployment rose across the entire country, and much of the world, the effects of the recession were spatially varied with some areas being hit harder than others (Farber 2012). Previous studies of the geography of job loss have only considered the location where the job was lost, the workplace. Using the home location of employees, employment trends during the recession and the recovery period following it, were assessed within and between a selection of metropolitan areas.

In order to identify these trends, the change in the number of employed residents was calculated between 2004, 2007, 2009, 2012, and 2015 for census block groups within ten metropolitan areas. The change in employment was assessed for all workers as well as by a number of demographic characteristics: age, income, and job industry. The resulting changes in employment were mapped, revealing that the greatest employment losses during the recession occurred among suburban residents. However, these suburban areas also experienced a much swifter recovery while the urban cores of cities had much more difficulty recovering losses. The recovery process was found to be quite long, with

most of the metropolitan areas only exceeding 2007 pre-recession employment totals in the 2012 to 2015 period.

The results of the demographic analysis showed a number of distinct trends as well. Younger employed residents experienced job loss at a much higher rate, with older residents faring the best among the age categories that were assessed. Lower income earners faced disproportionately greater loss of employment, while higher income earners saw the most growth. Comparing the performance of different job sectors, residents employed in secondary industry jobs (e.g. construction and manufacturing) experienced much greater job loss during the recession while public industry employment (e.g. education and health) saw continued growth during and after the recession.

A finer spatial scale was used than in most previous studies, which introduced significant variability between different metropolitan areas but also allowed intraurban trends to be identified. These trends were identified visually; in the future, a more objective method could be applied to analyze the spatial patterns of employment change. Additionally, the inclusion of demographics such as race and gender, which were not fully available in the dataset that was used, could provide further insight into the varied patterns of job loss during the recession.

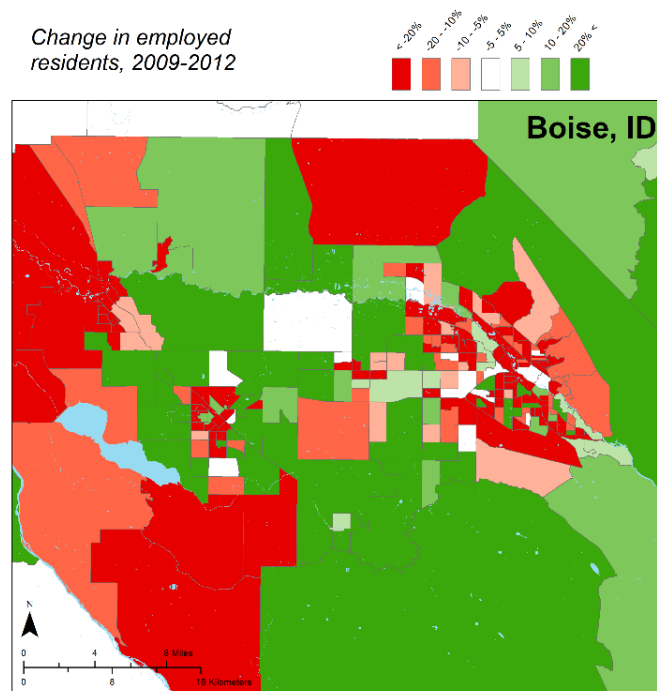
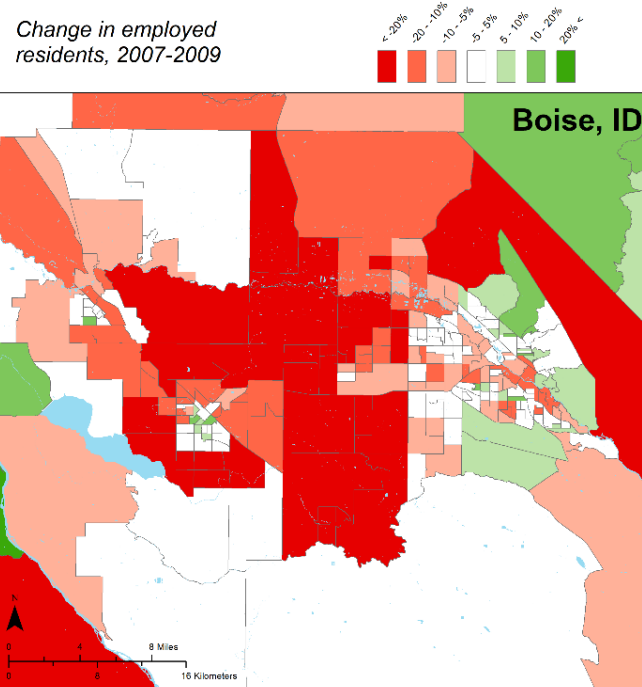
The cyclical nature of the economy means that more recessions are bound to occur in the future. If the effects that recessions can have on local labor markets and populations are better understood, then perhaps the resiliency and responsiveness of communities to economic shocks can be improved. This requires decision makers to be accurately informed so that resources can be allocated accordingly. By exploring the

trajectory of employment during and after the recession from the home location perspective and using an appropriate spatial scale, this study contributes to that necessary knowledge.

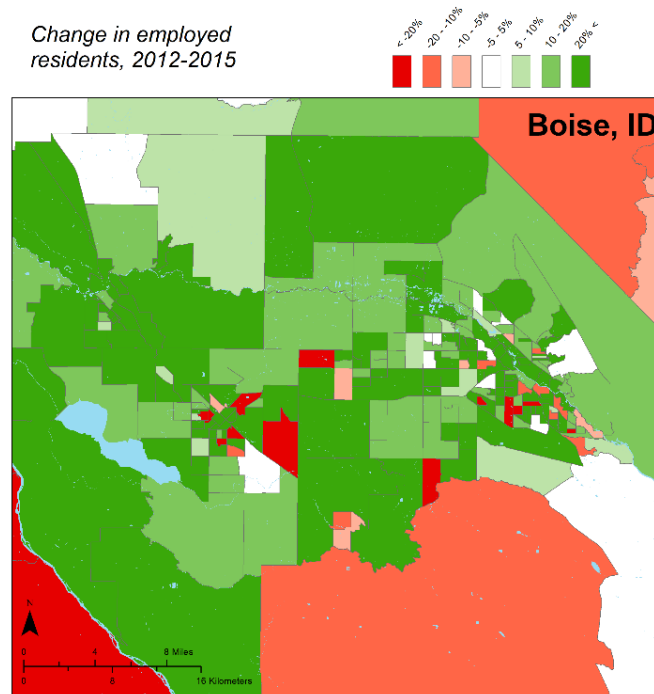
APPENDICES

APPENDIX A

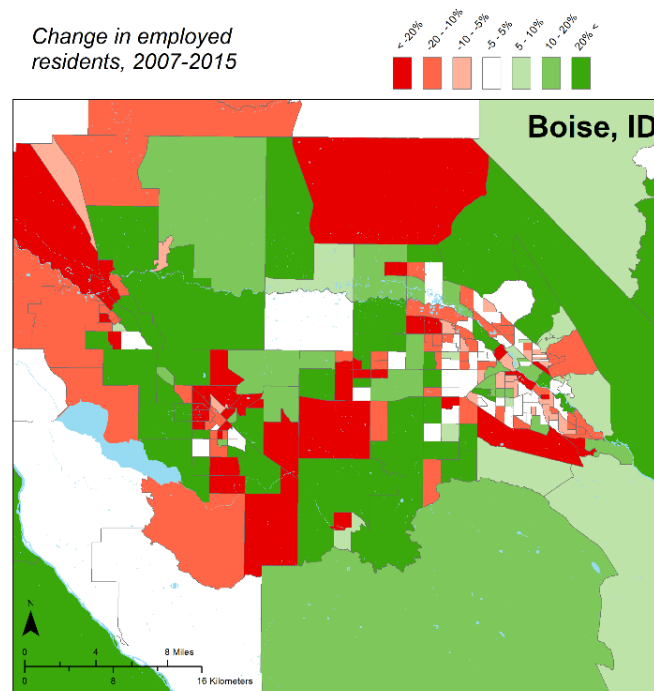
Maps of change in employment



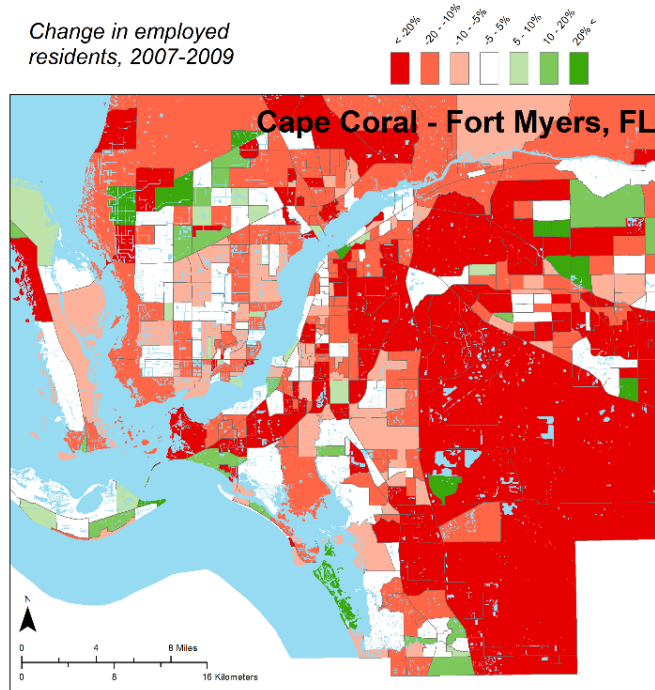
Change in employed residents, 2012-2015



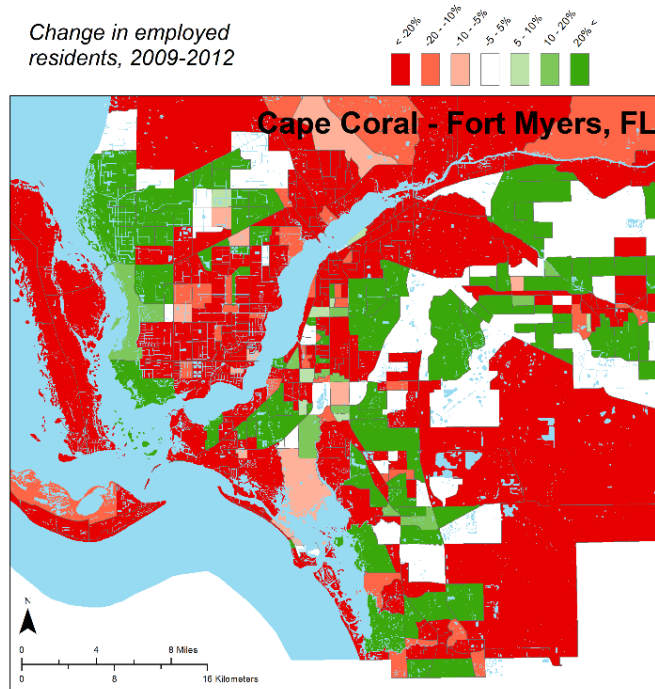
Change in employed residents, 2007-2015



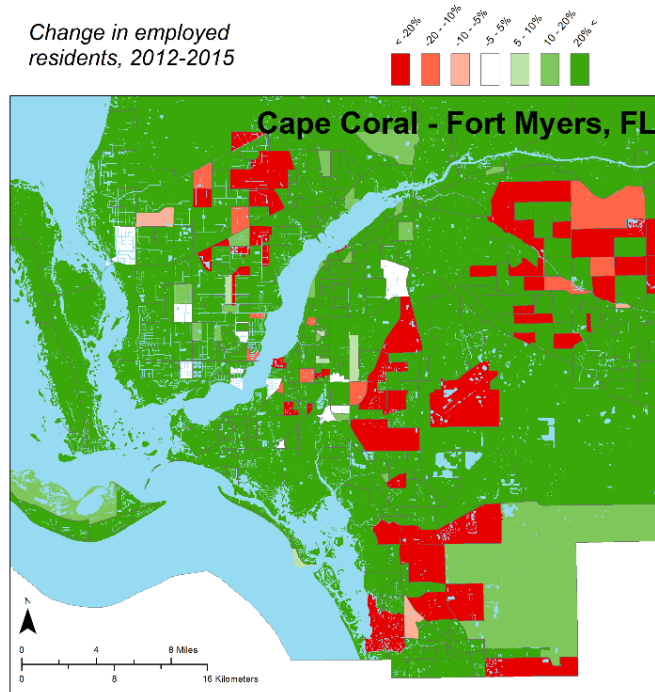
Change in employed residents, 2007-2009



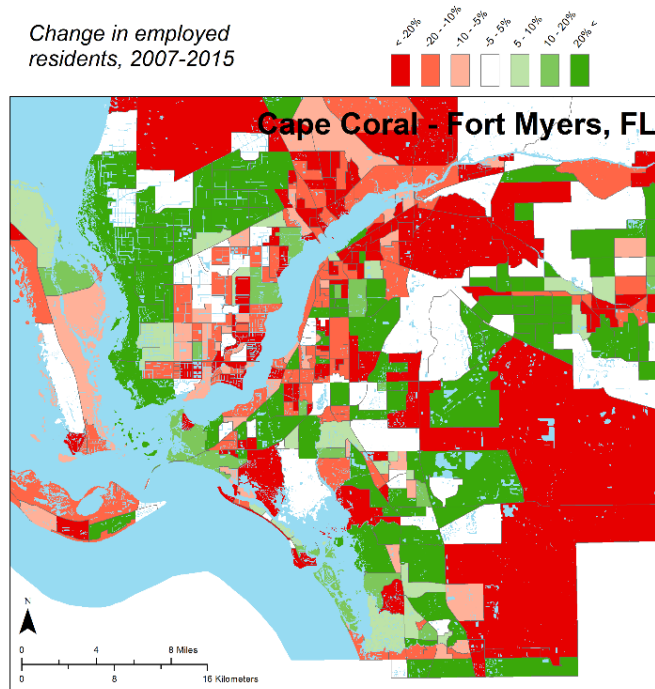
Change in employed residents, 2009-2012



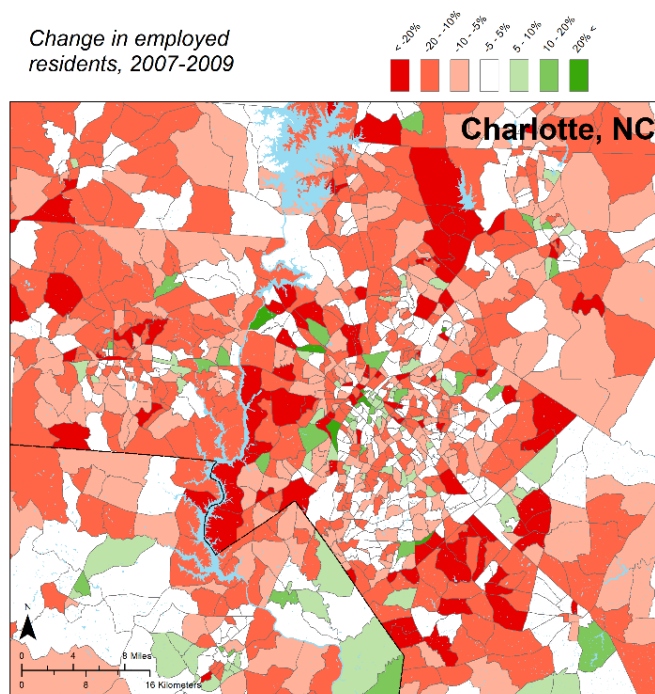
Change in employed residents, 2012-2015



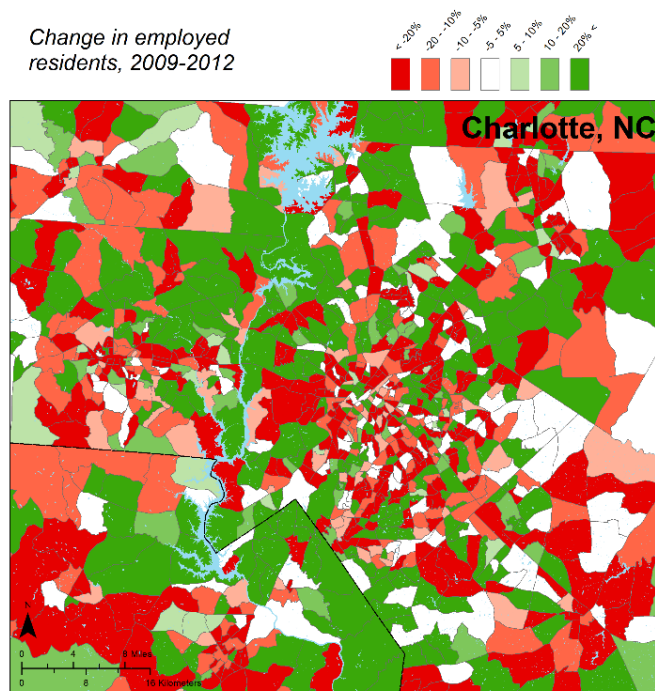
Change in employed residents, 2007-2015



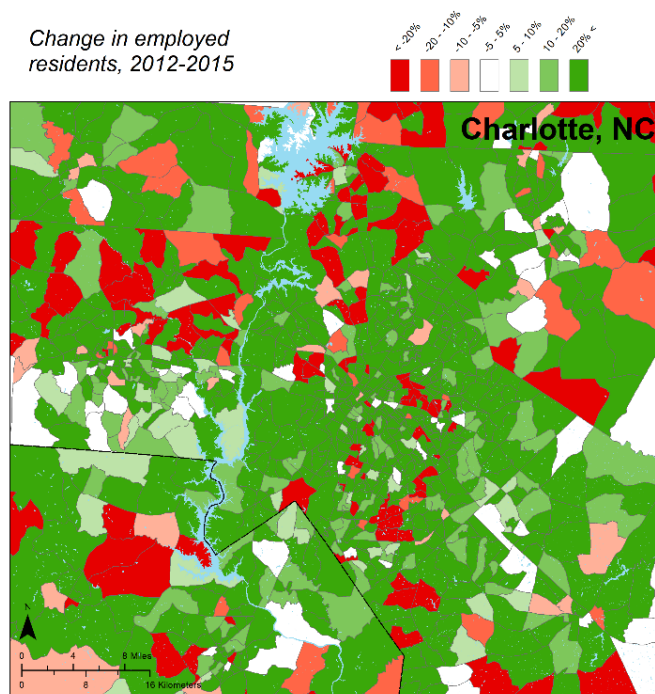
Change in employed residents, 2007-2009



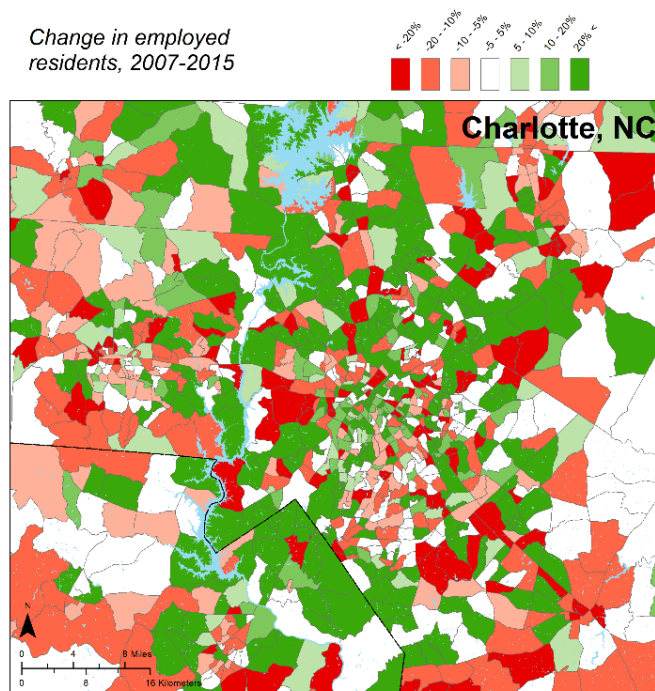
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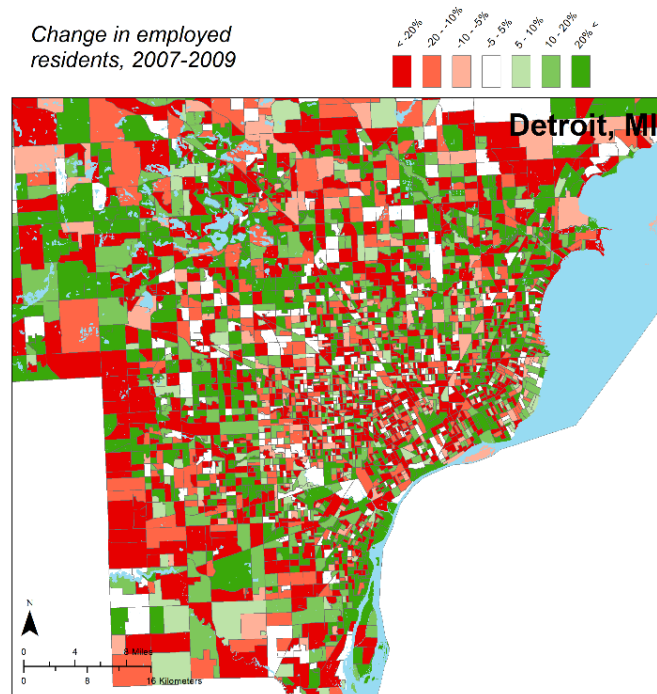
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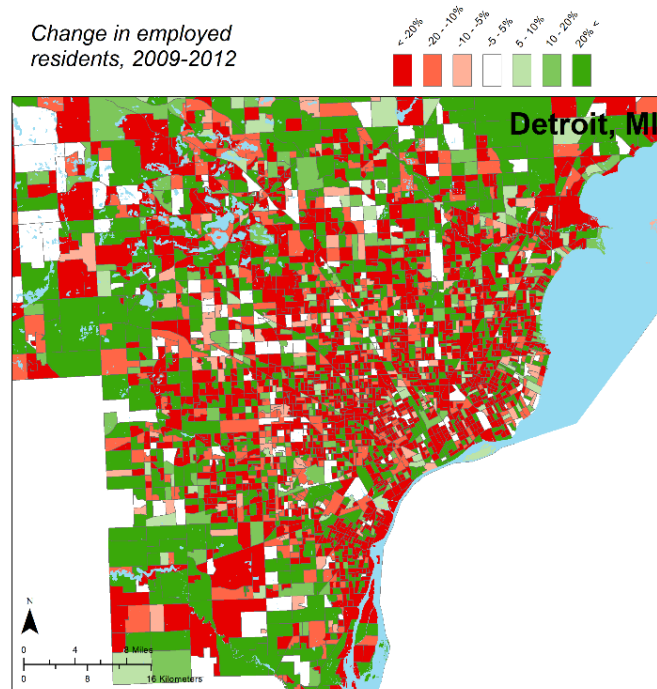
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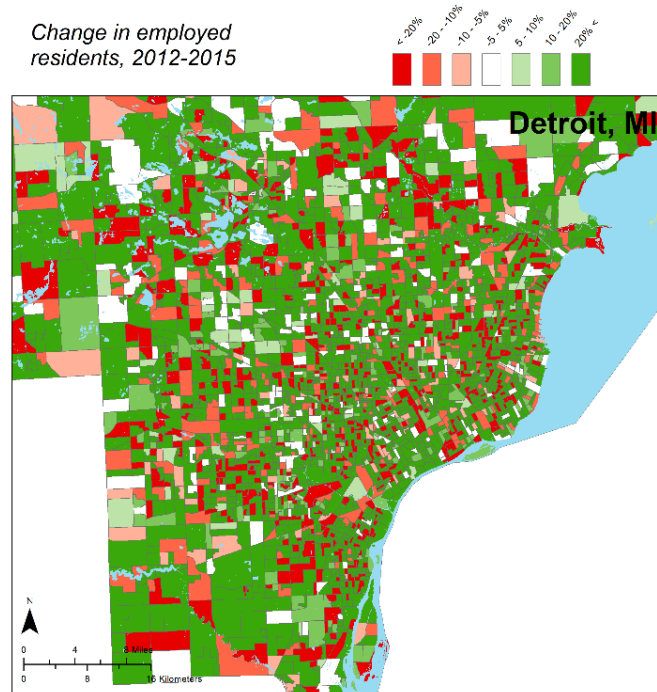
Change in employed residents, 2007-2009



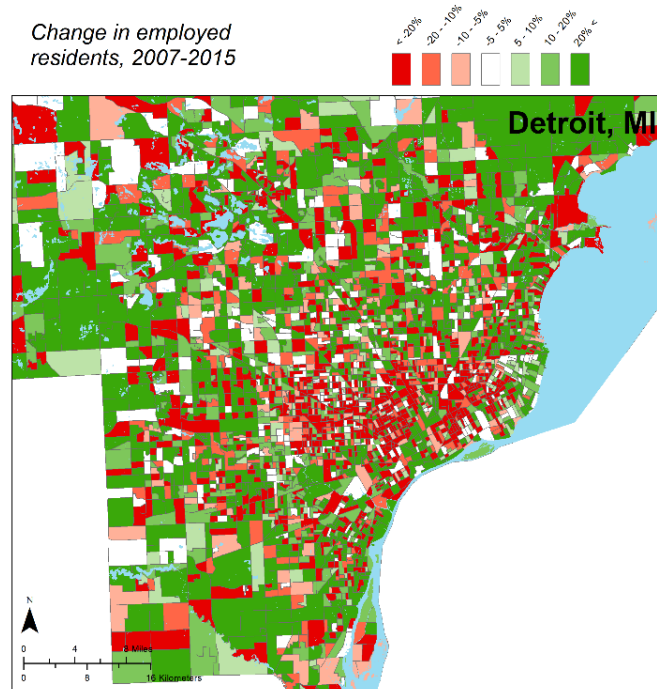
Change in employed residents, 2009-2012



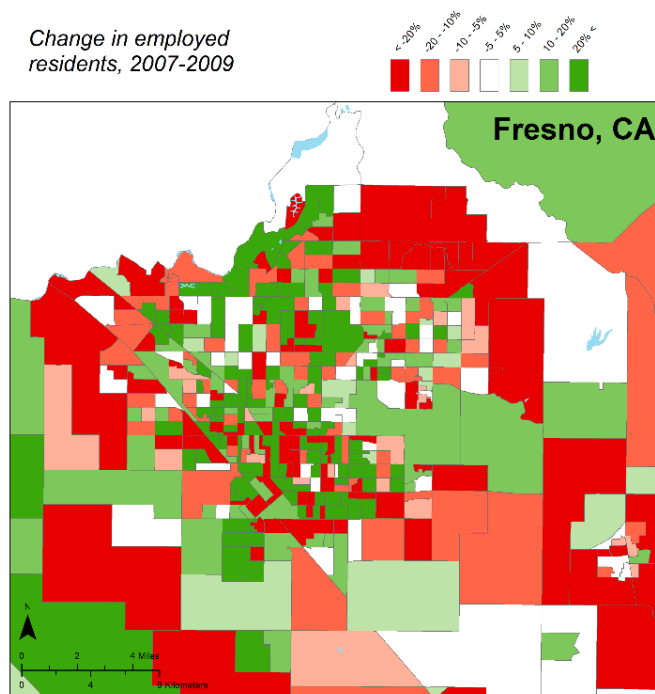
Change in employed residents, 2012-2015



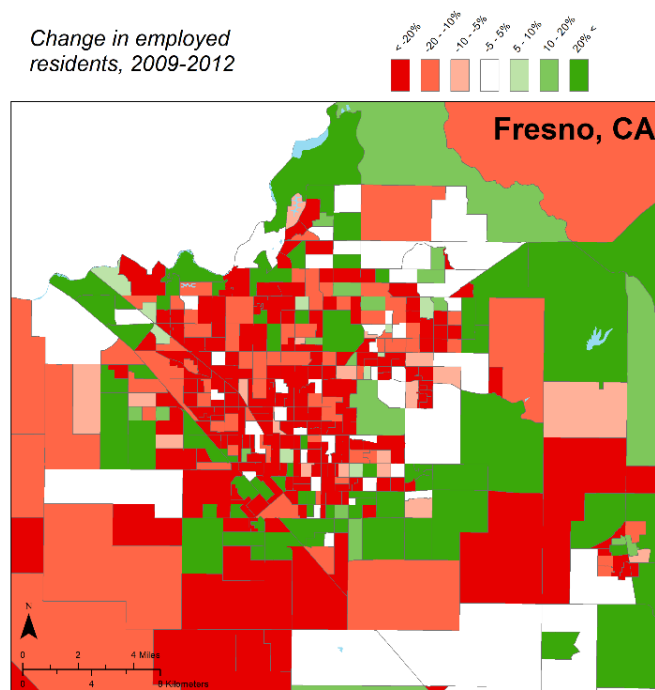
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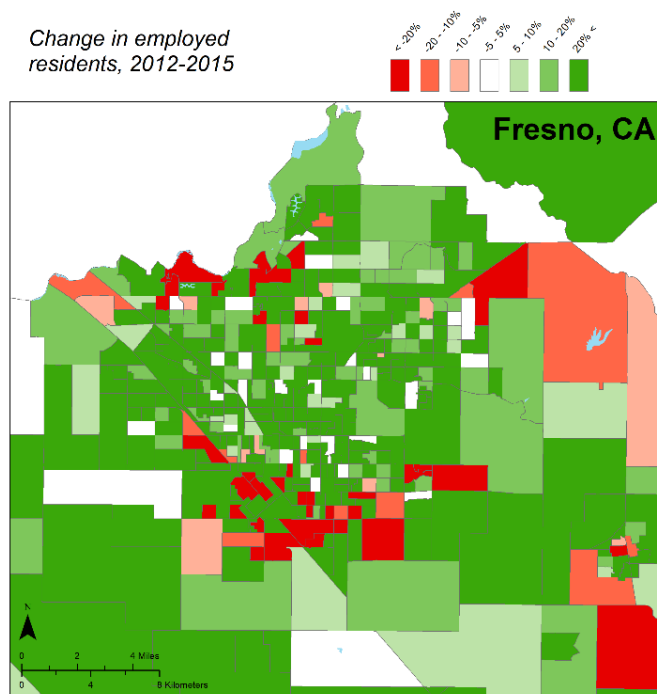
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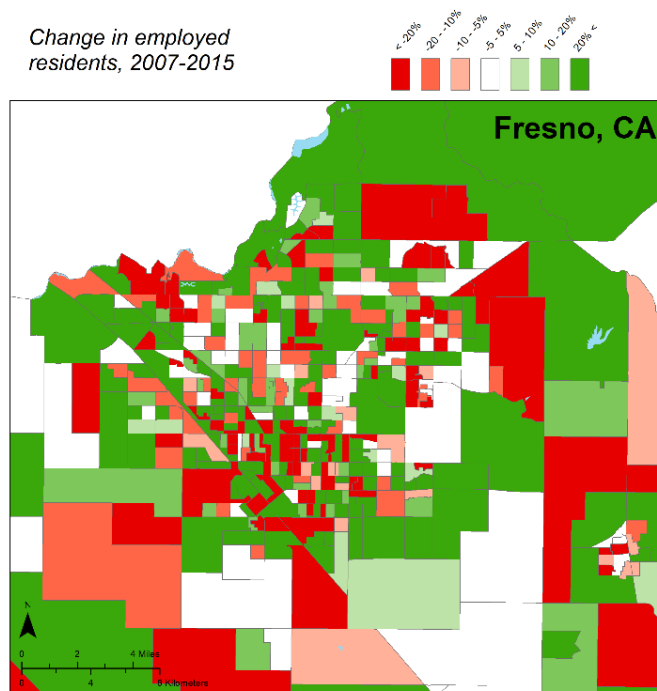
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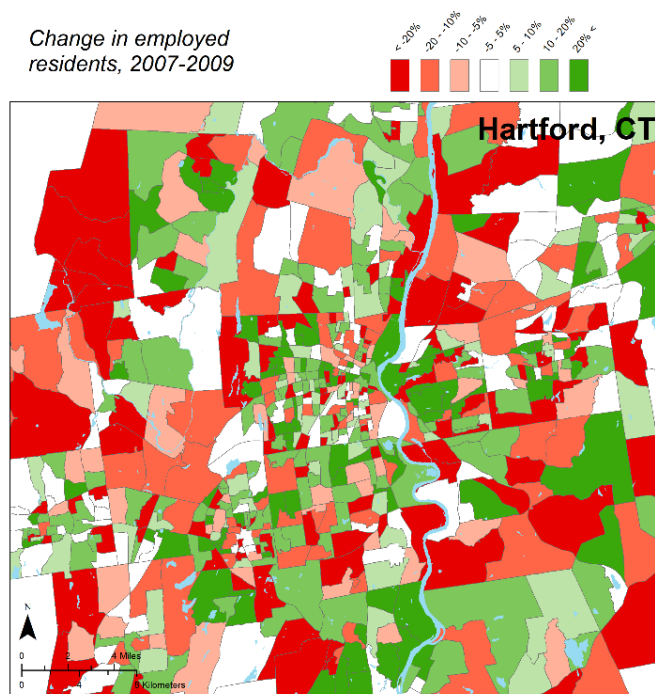
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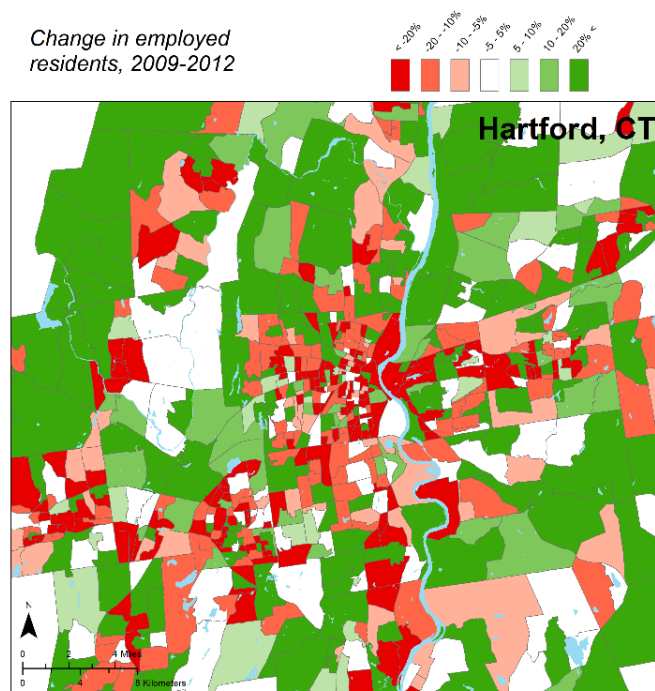
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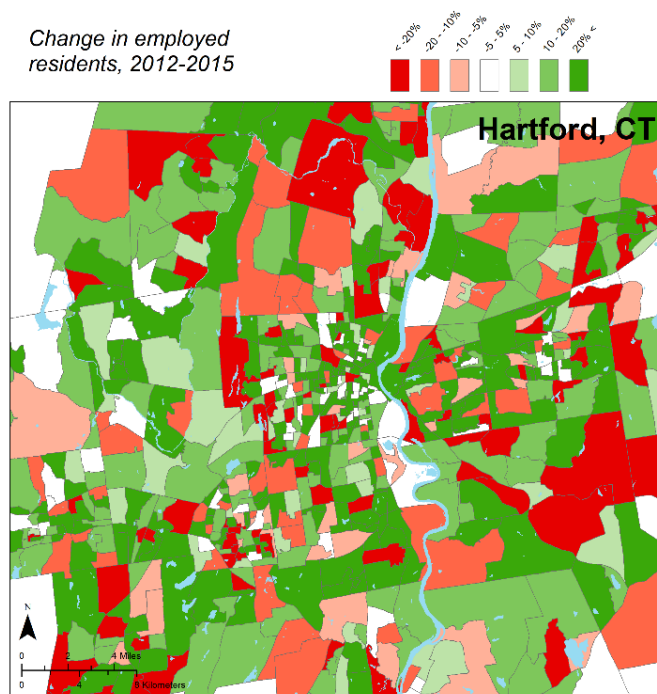
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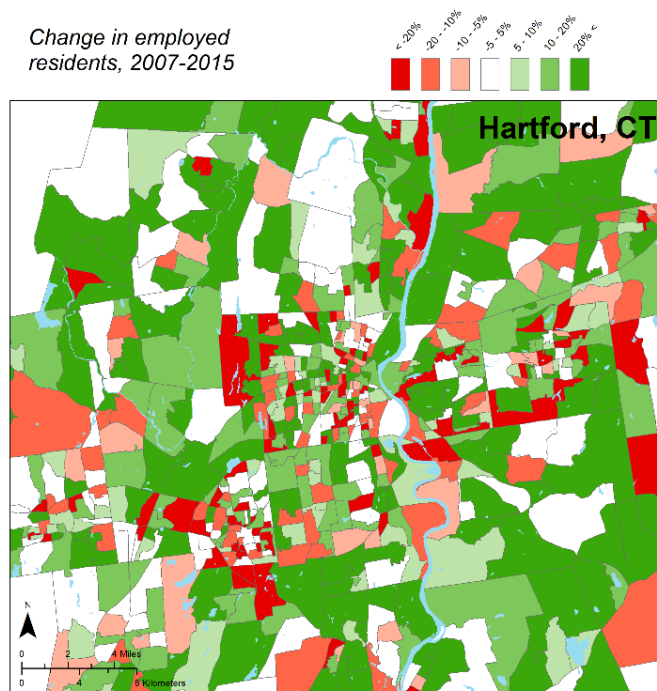
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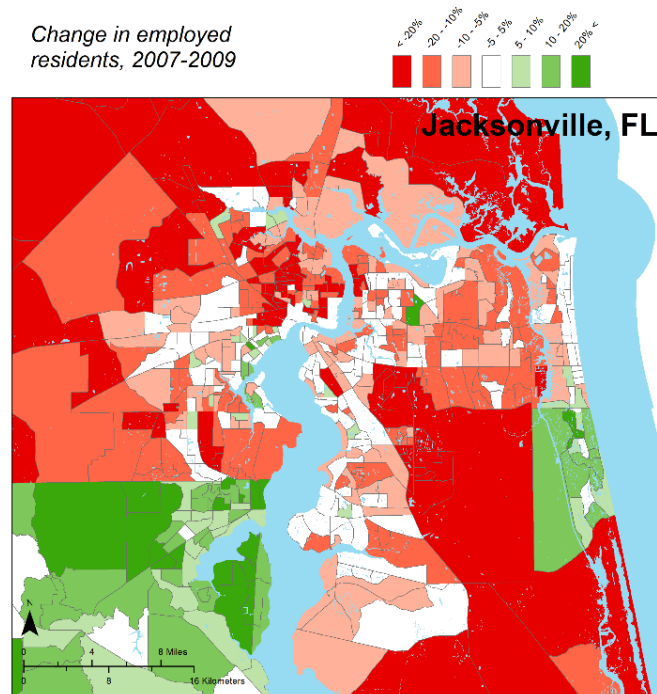
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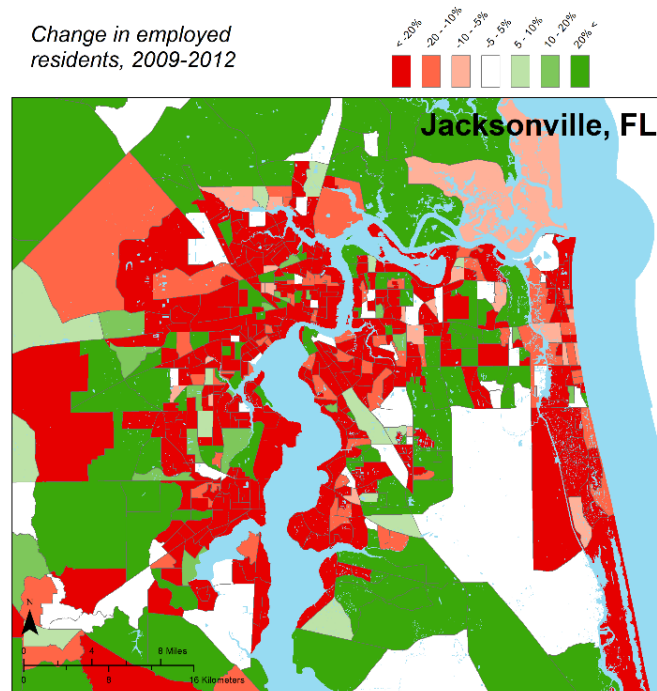
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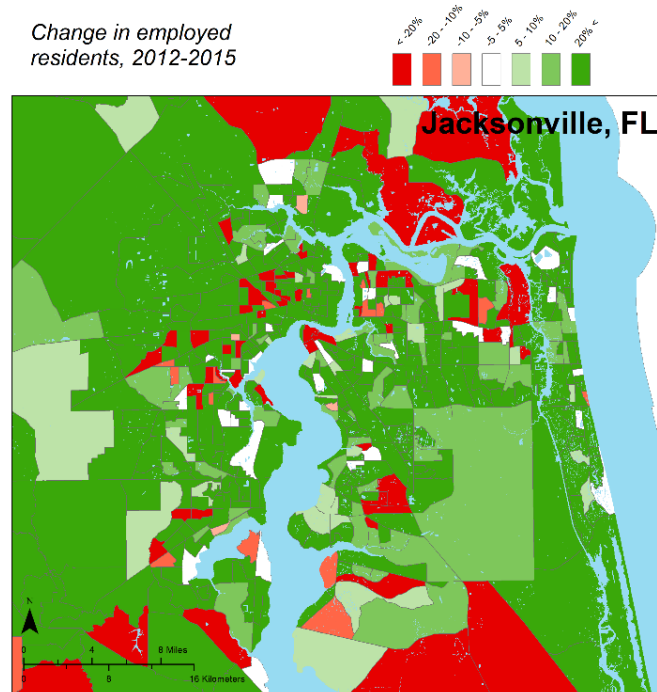
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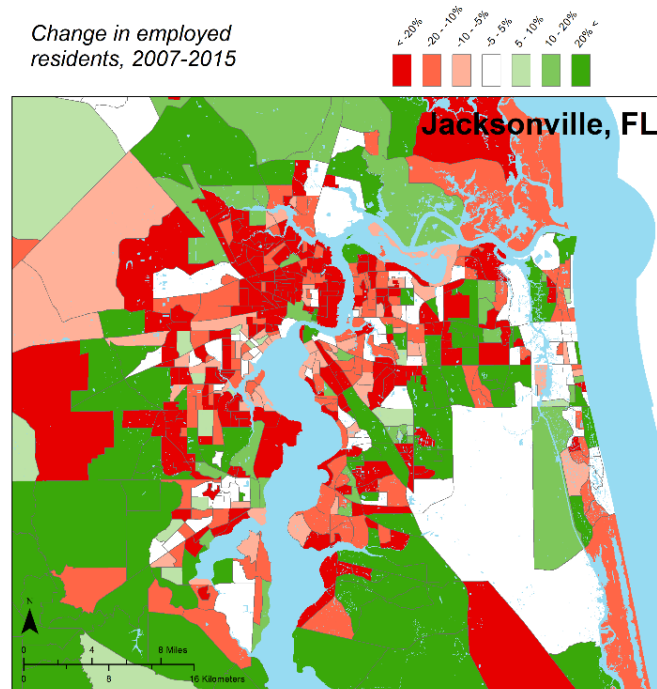
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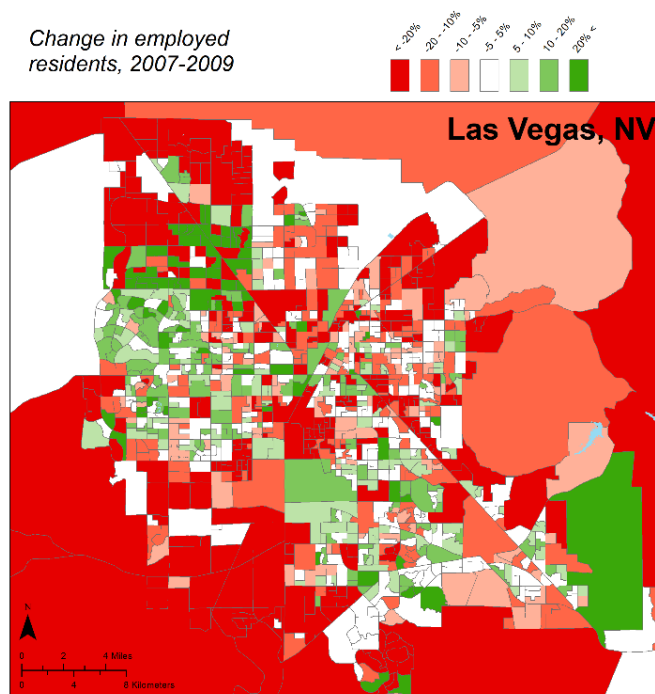
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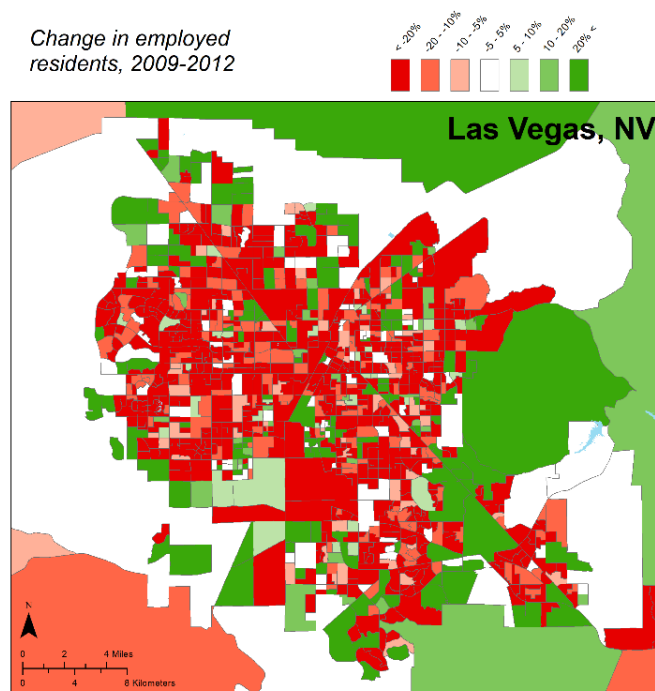
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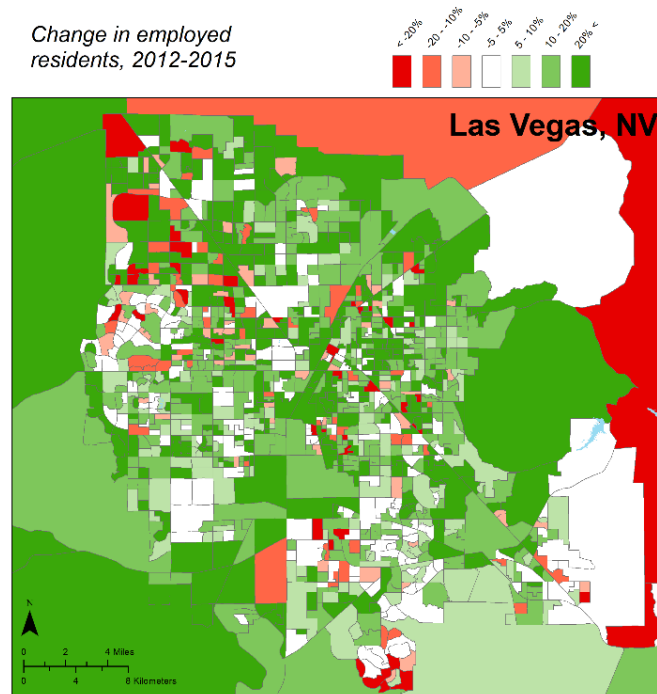
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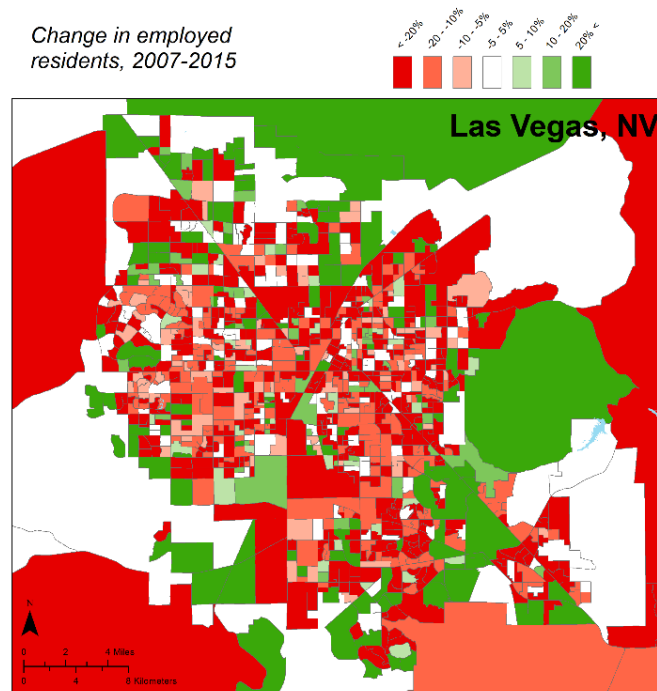
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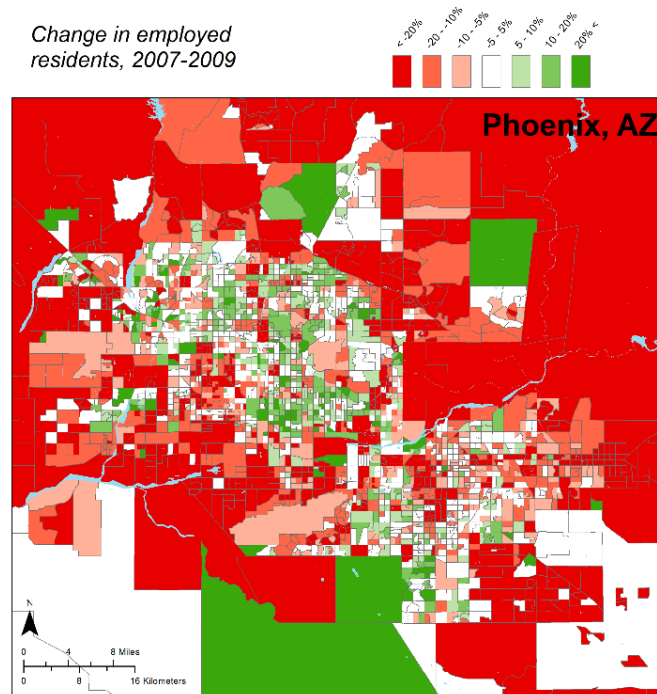
Change in employed residents, 2012-2015



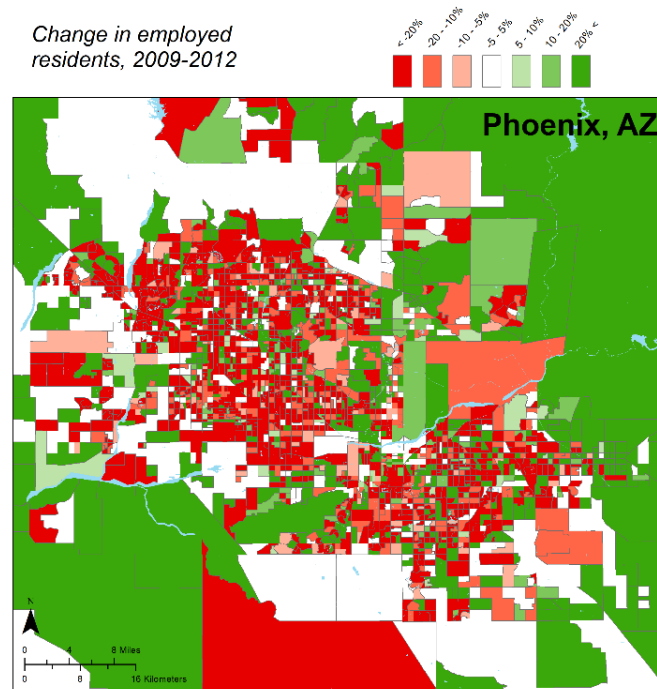
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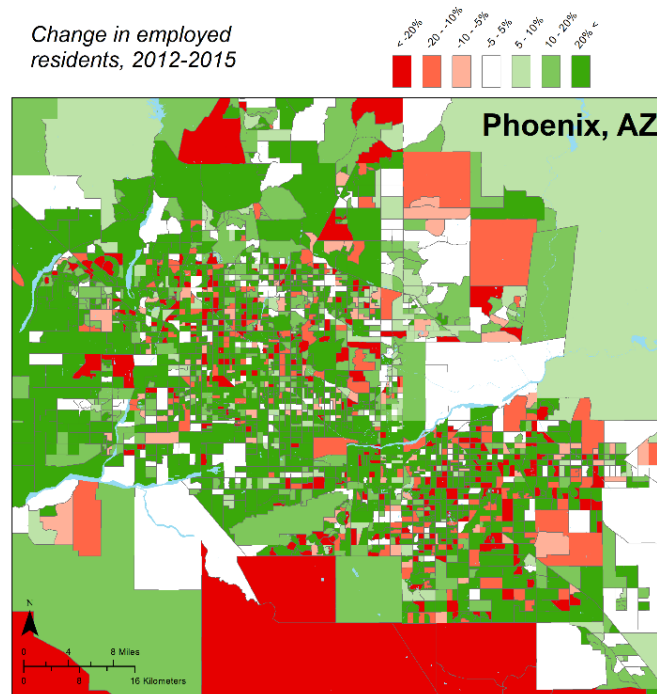
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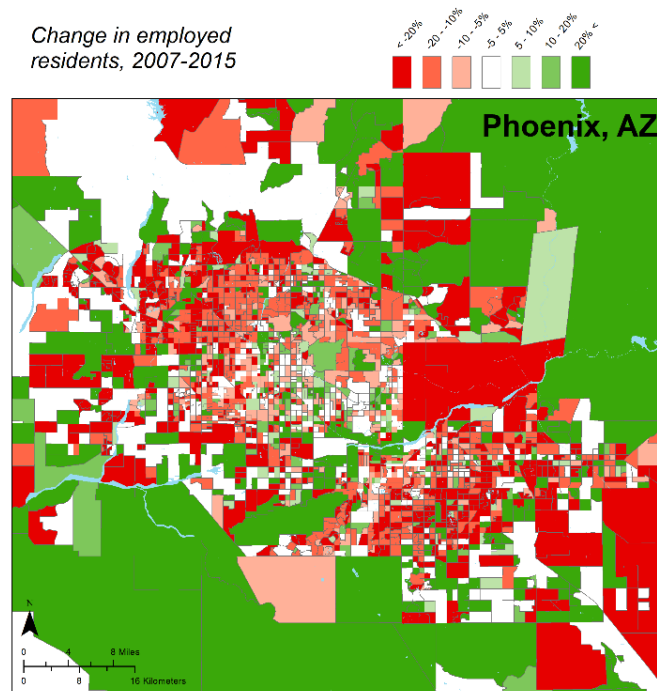
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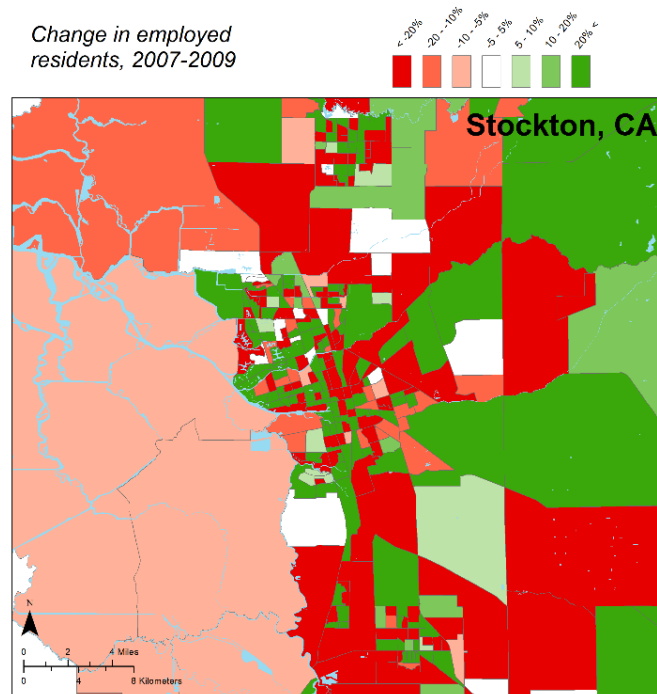
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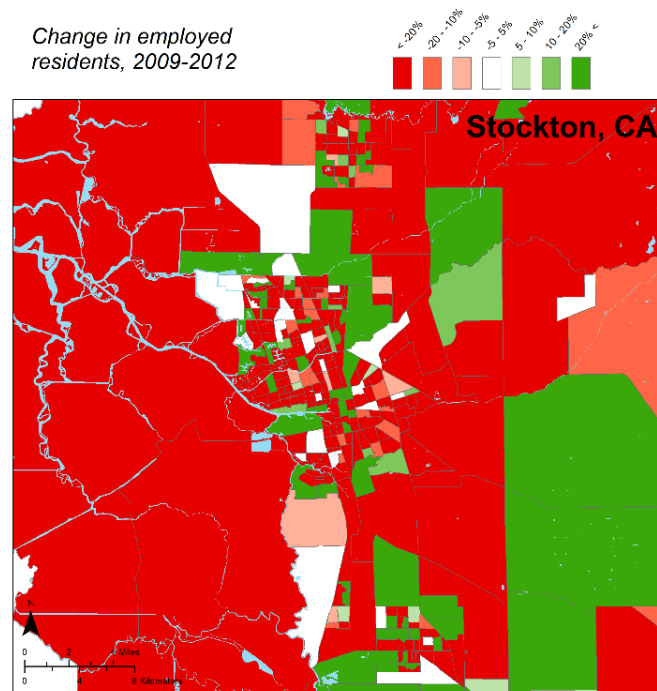
Change in employed residents, 2007-2015



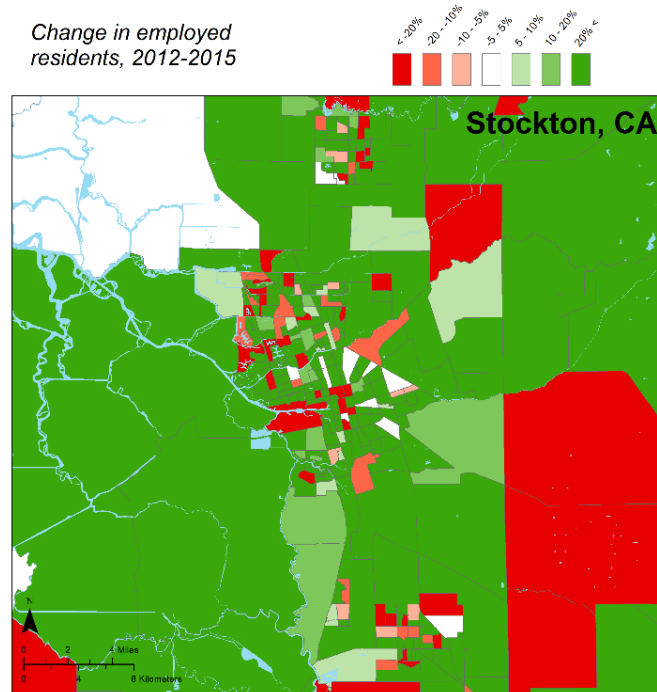
Change in employed residents, 2007-2009



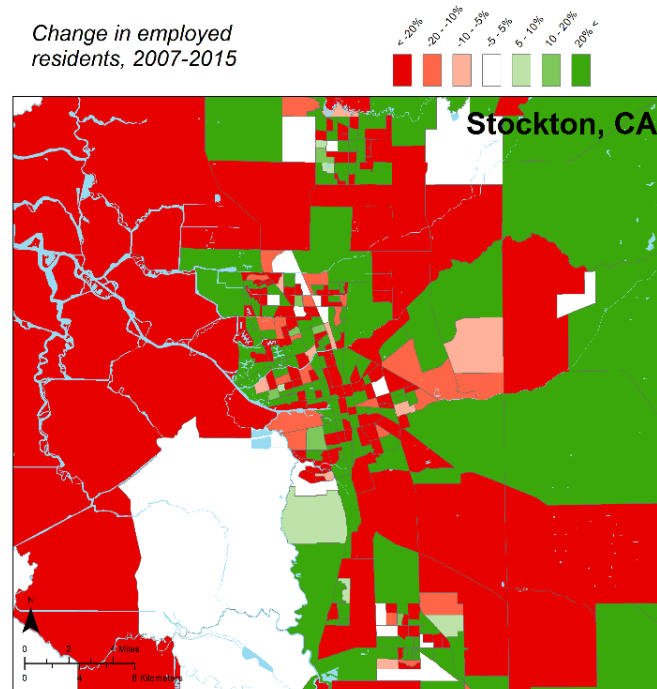
Change in employed residents, 2009-2012



Change in employed residents, 2012-2015



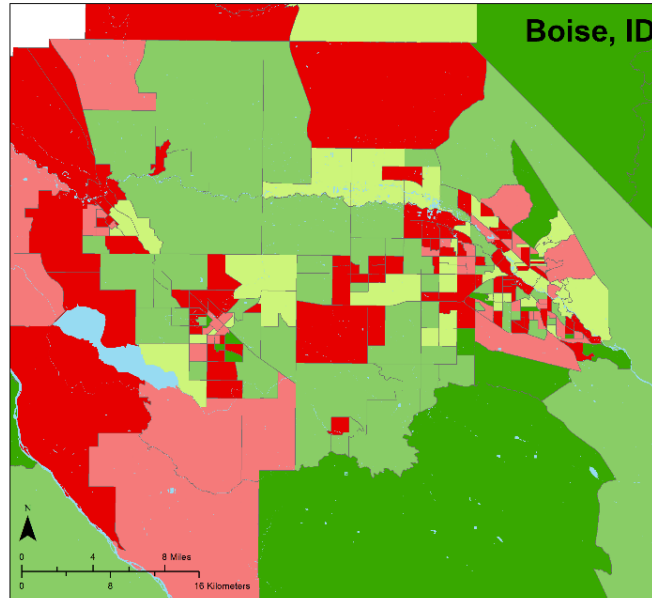
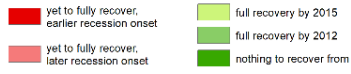
Change in employed residents, 2007-2015



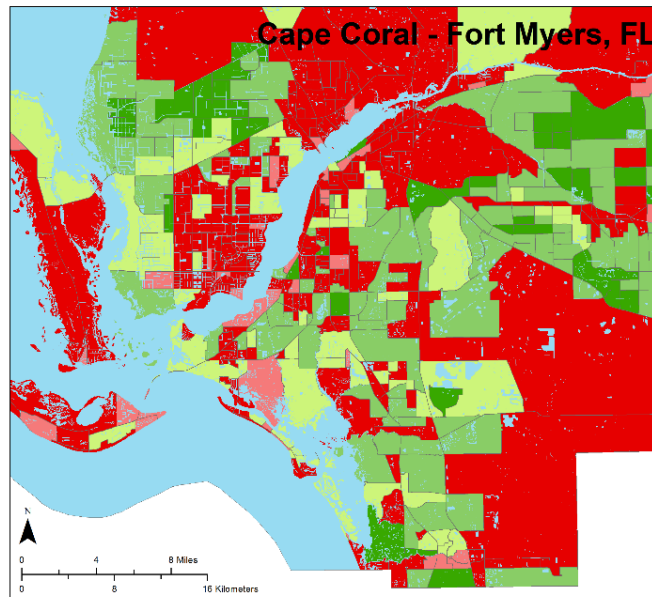
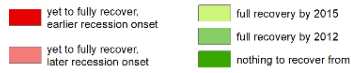
APPENDIX B

Maps of employment recovery trajectory

*Employment recovery
following the recession*

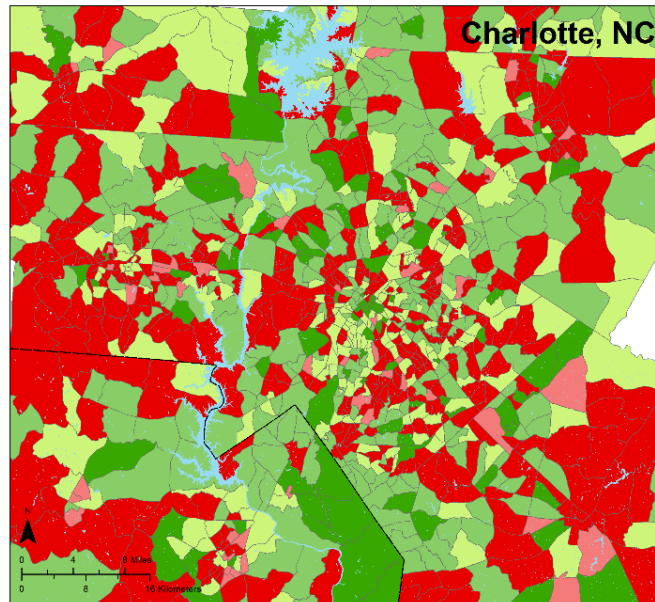


*Employment recovery
following the recession*



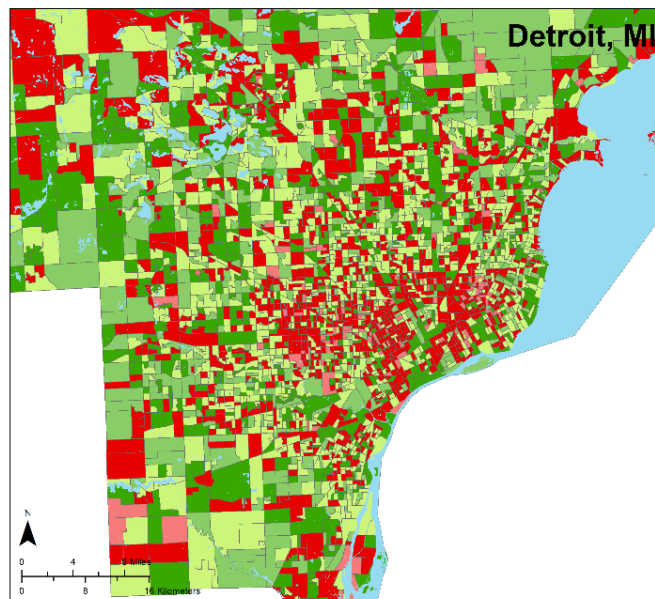
Employment recovery following the recession

- | | |
|--|--|
| ■ yet to fully recover, earlier recession onset | ■ full recovery by 2015 |
| ■ yet to fully recover, later recession onset | ■ full recovery by 2012 |
| | ■ nothing to recover from |

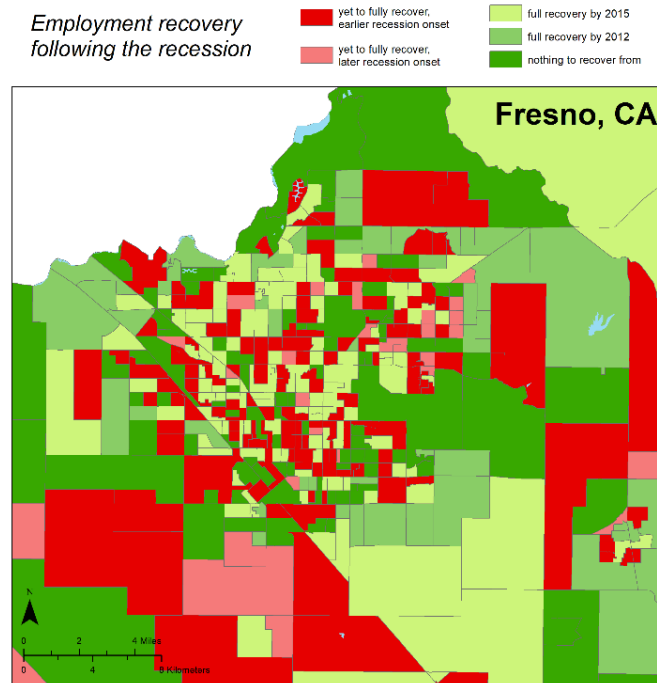


Employment recovery following the recession

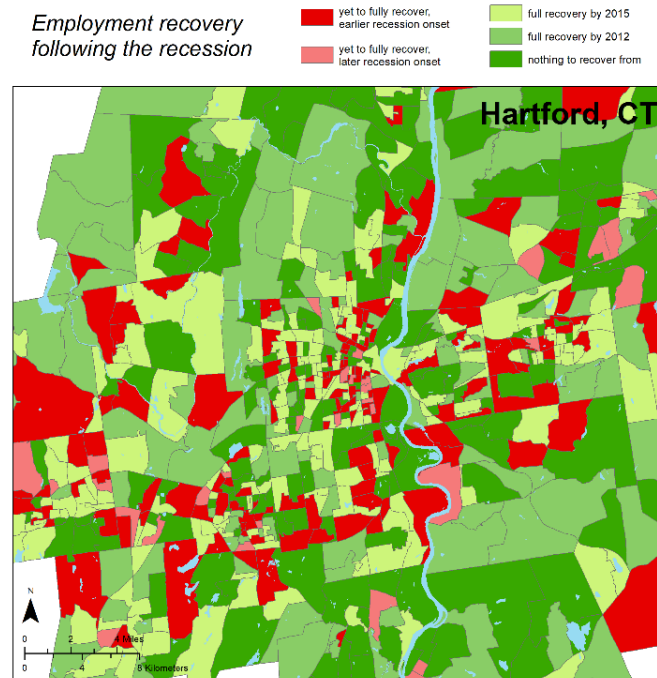
- | | |
|--|--|
| ■ yet to fully recover, earlier recession onset | ■ full recovery by 2015 |
| ■ yet to fully recover, later recession onset | ■ full recovery by 2012 |
| | ■ nothing to recover from |



Employment recovery following the recession

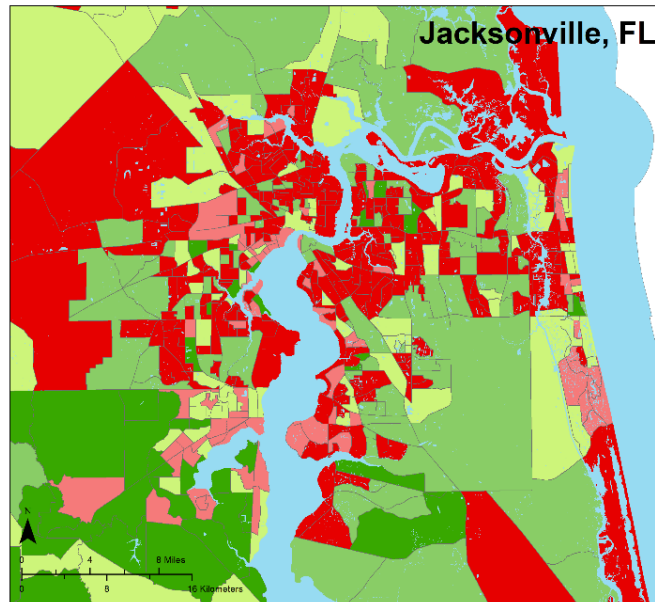


Employment recovery following the recession



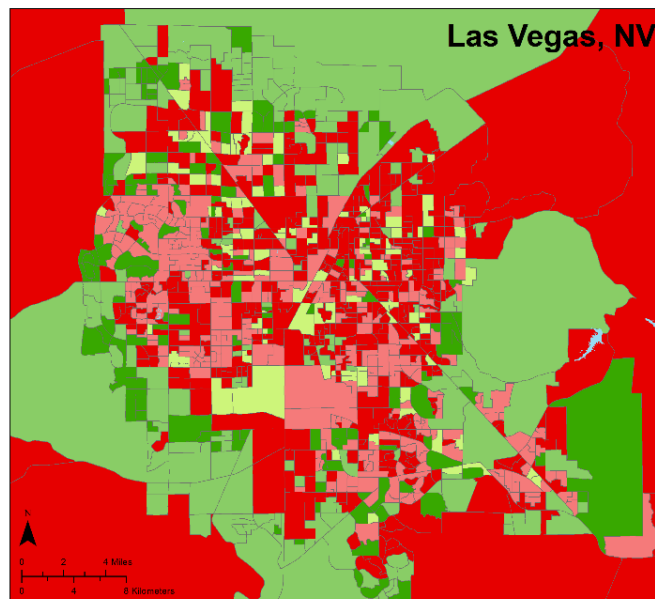
Employment recovery following the recession

- | | |
|--|--|
| ■ yet to fully recover, earlier recession onset | ■ full recovery by 2015 |
| ■ yet to fully recover, later recession onset | ■ full recovery by 2012 |
| | ■ nothing to recover from |



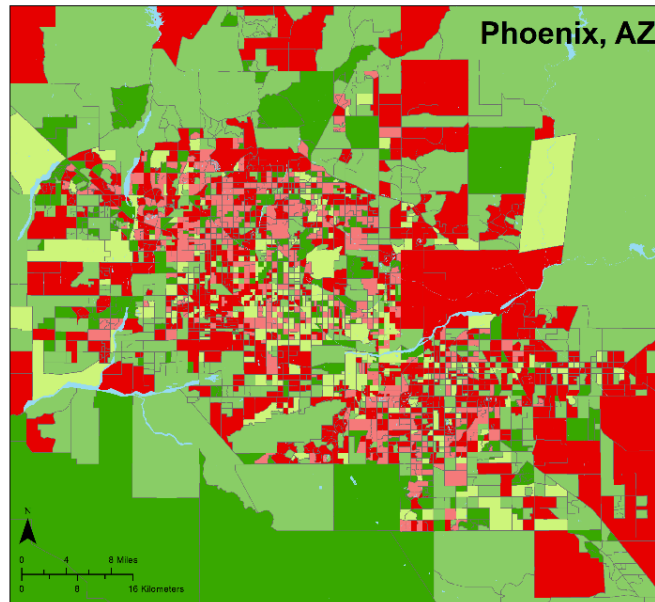
Employment recovery following the recession

- | | |
|--|--|
| ■ yet to fully recover, earlier recession onset | ■ full recovery by 2015 |
| ■ yet to fully recover, later recession onset | ■ full recovery by 2012 |
| | ■ nothing to recover from |



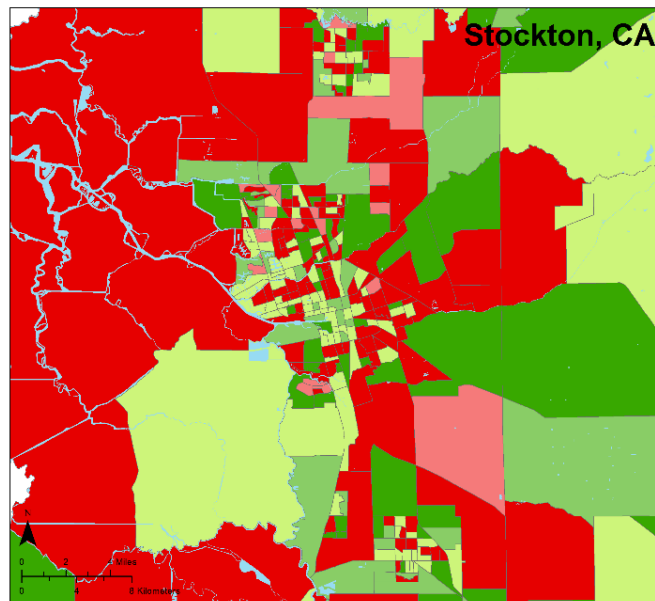
*Employment recovery
following the recession*

- | | |
|---|--|
| ■ yet to fully recover,
earlier recession onset | ■ full recovery by 2015 |
| ■ yet to fully recover,
later recession onset | ■ full recovery by 2012 |
| | ■ nothing to recover from |



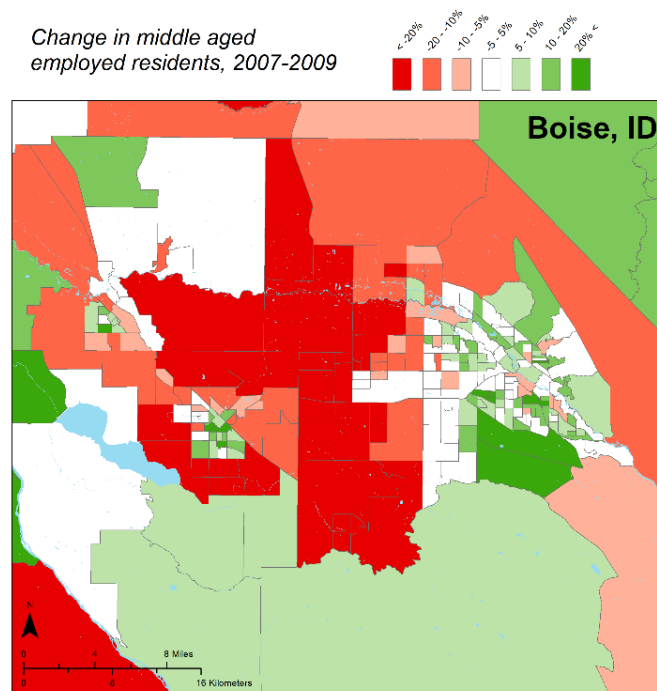
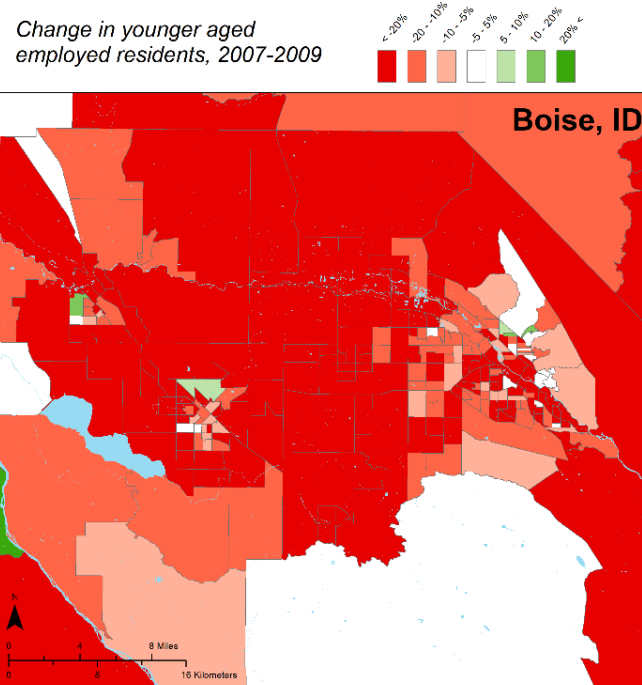
*Employment recovery
following the recession*

- | | |
|---|--|
| ■ yet to fully recover,
earlier recession onset | ■ full recovery by 2015 |
| ■ yet to fully recover,
later recession onset | ■ full recovery by 2012 |
| | ■ nothing to recover from |

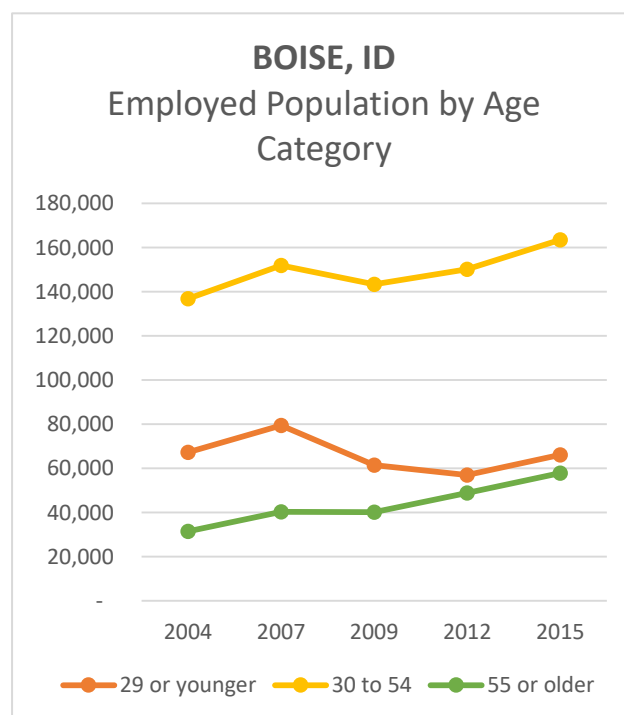
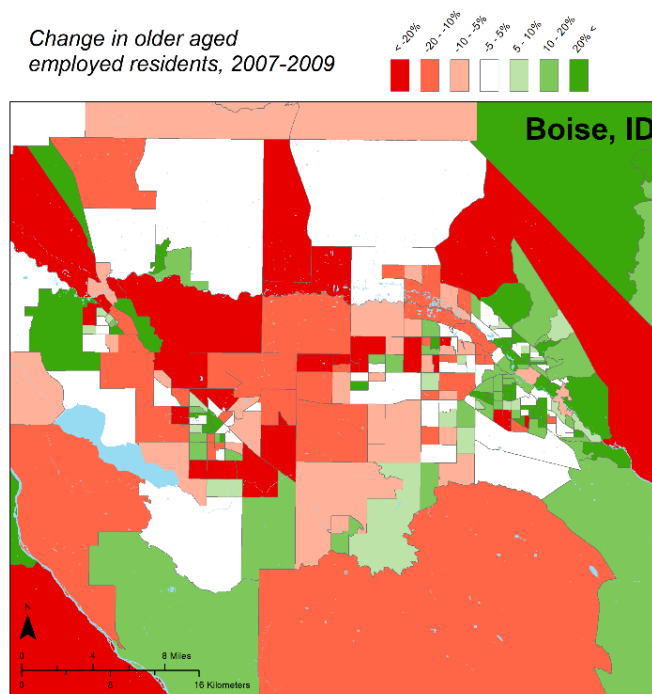


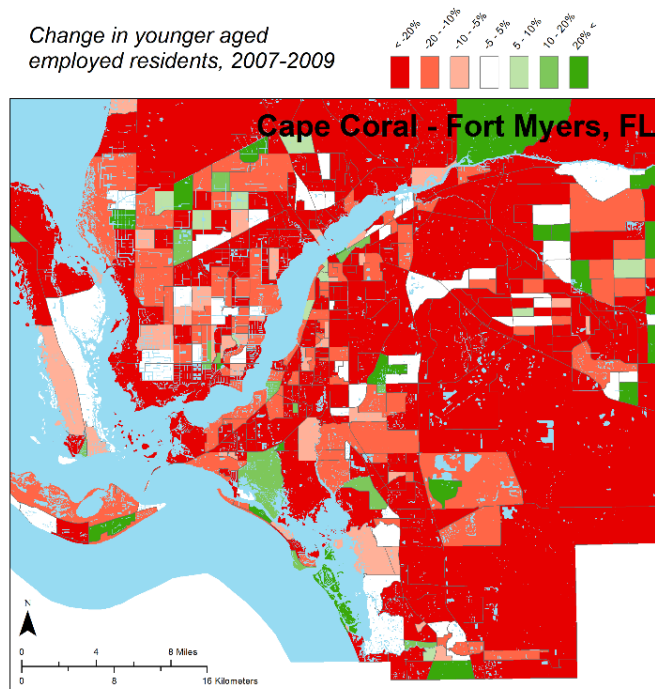
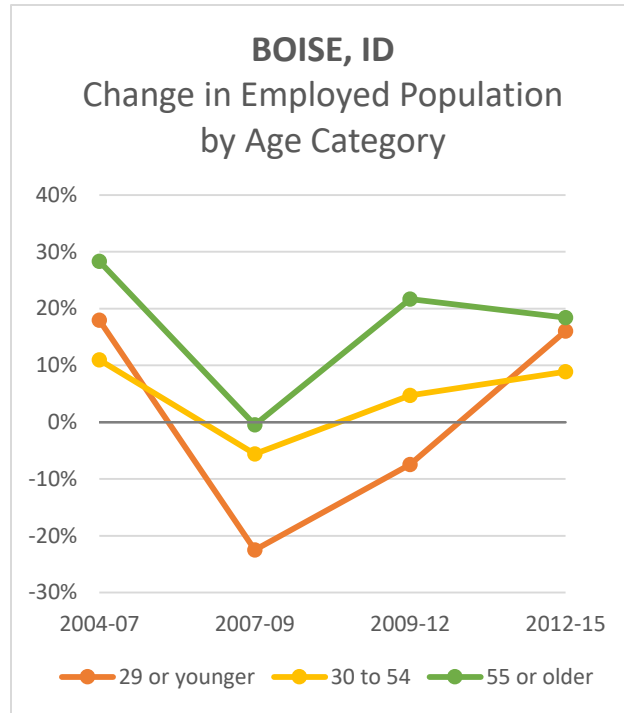
APPENDIX C

Maps and charts of change in employed residents by age

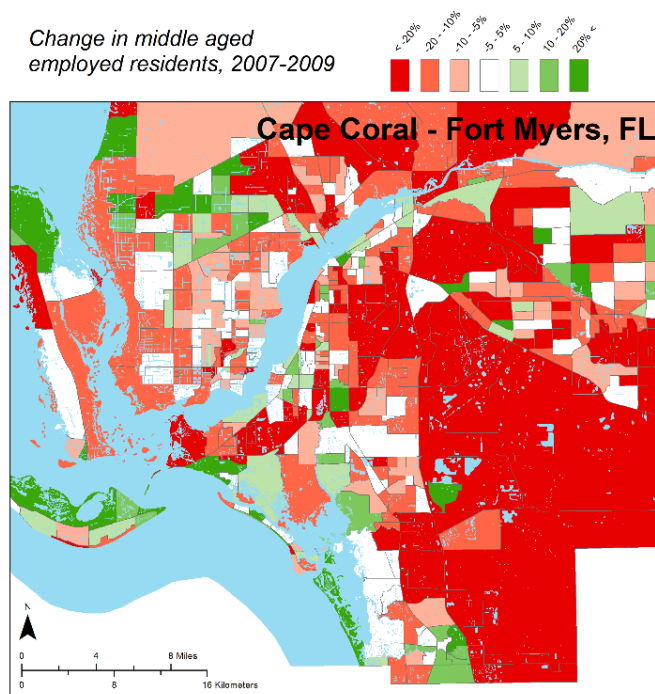


Change in older aged
employed residents, 2007-2009

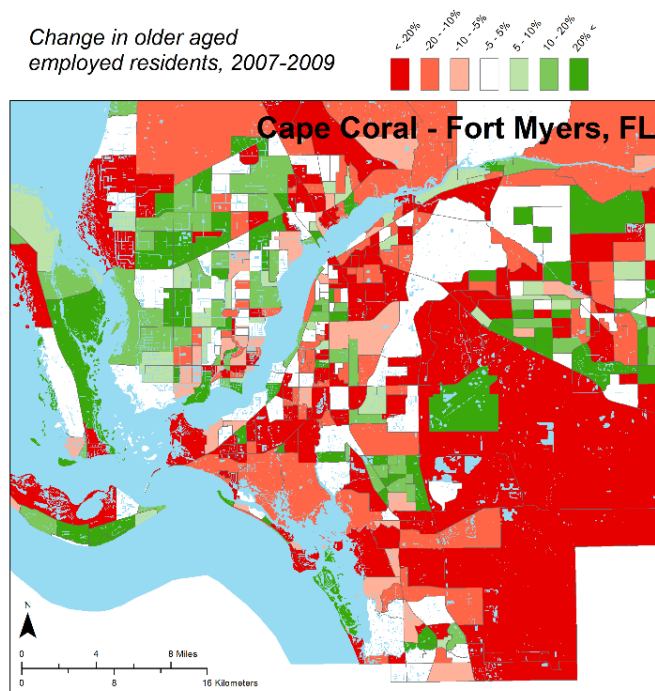


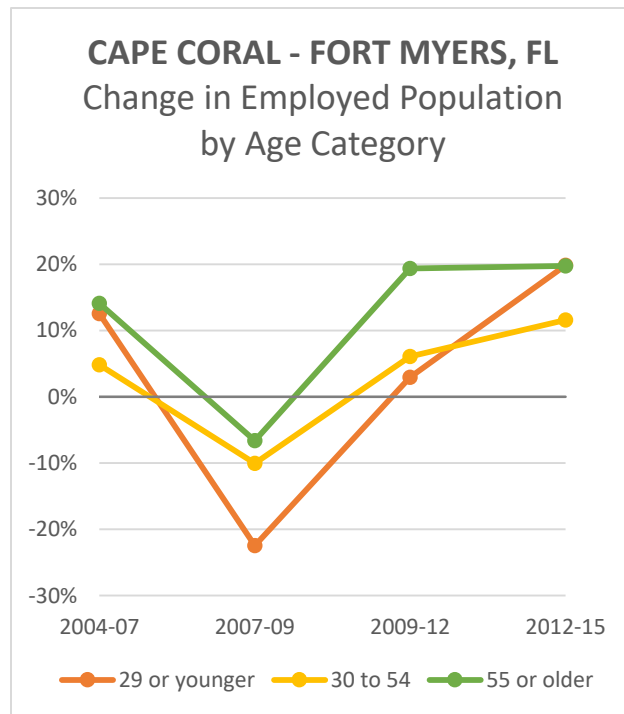
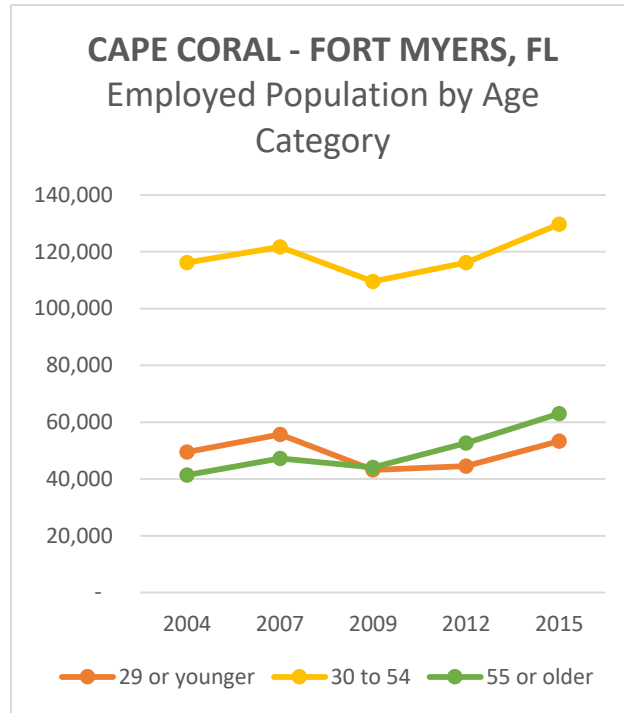


Change in middle aged
employed residents, 2007-2009

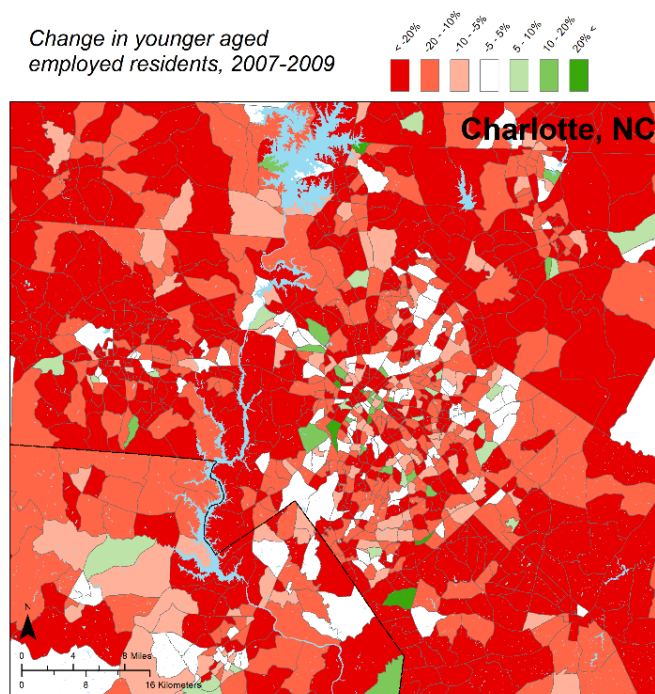


Change in older aged
employed residents, 2007-2009

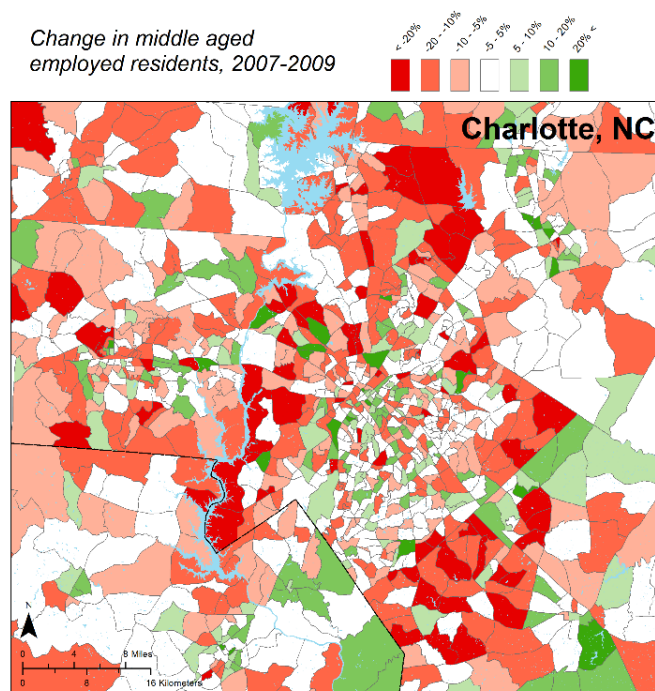




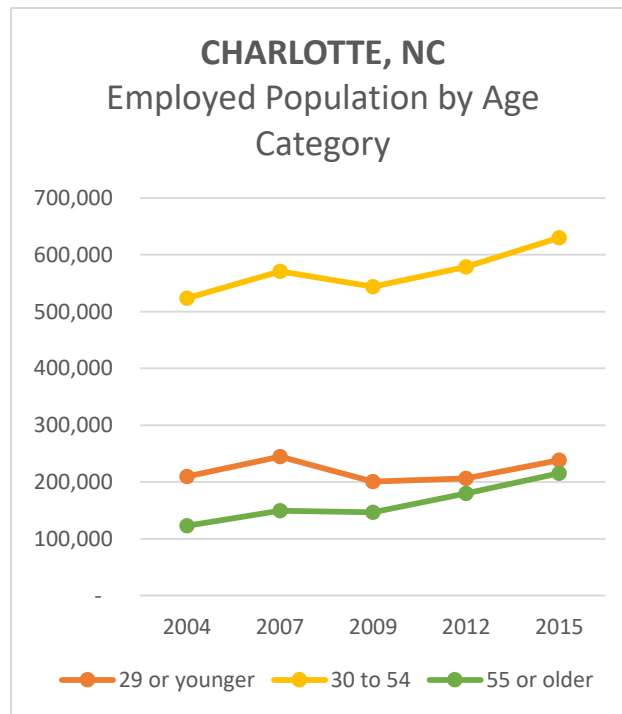
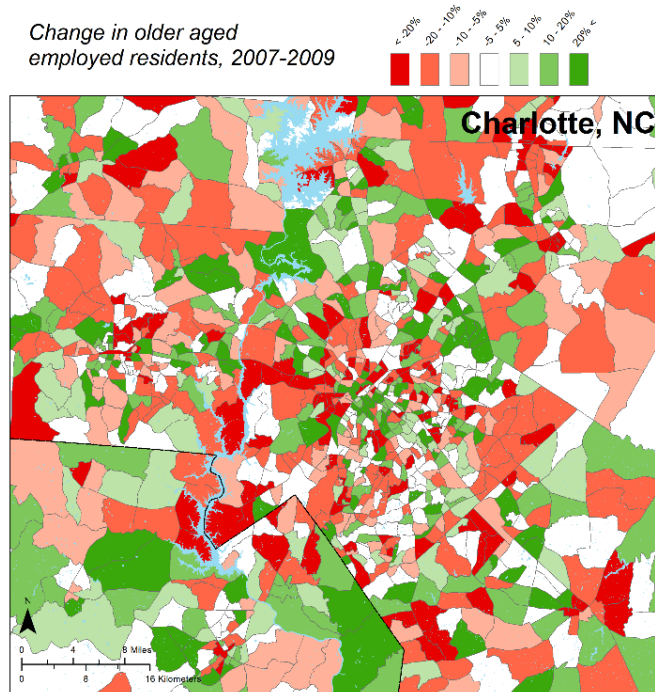
Change in younger aged
employed residents, 2007-2009

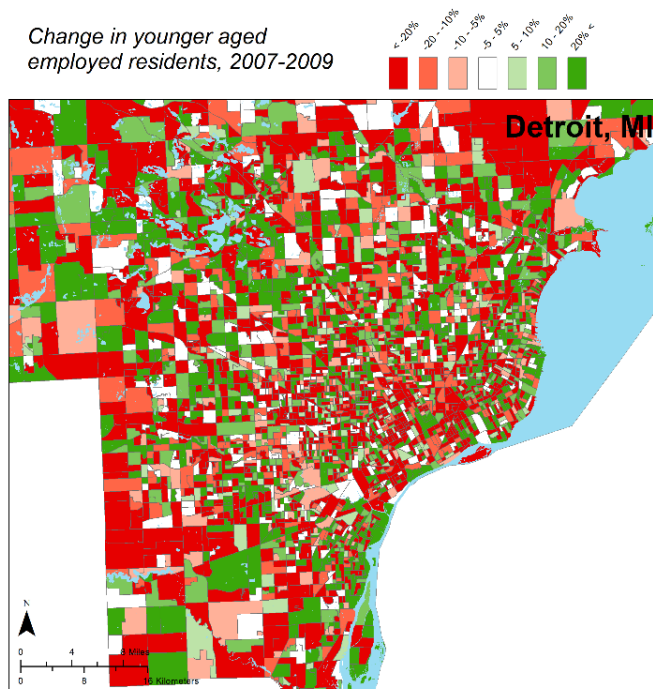
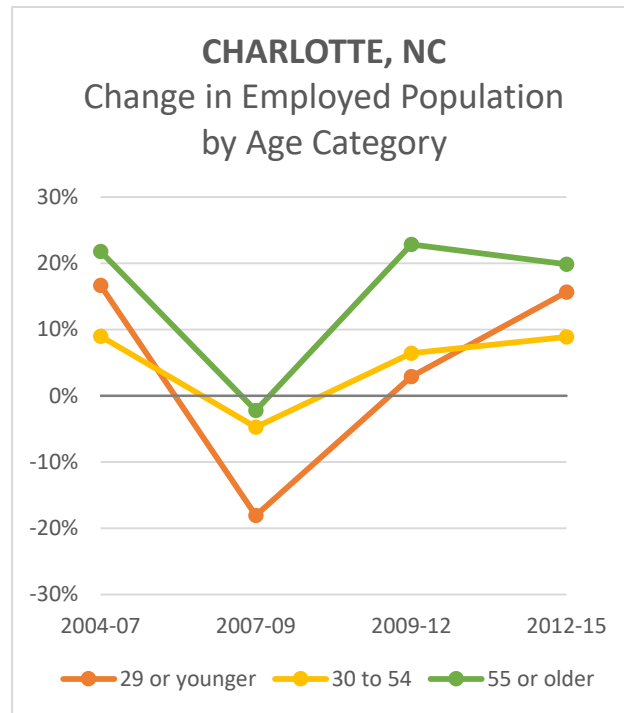


Change in middle aged
employed residents, 2007-2009

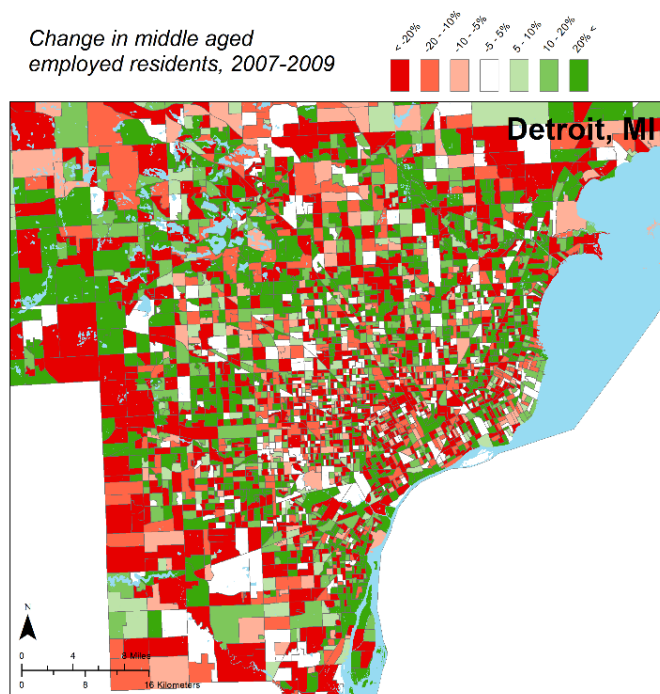


Change in older aged
employed residents, 2007-2009

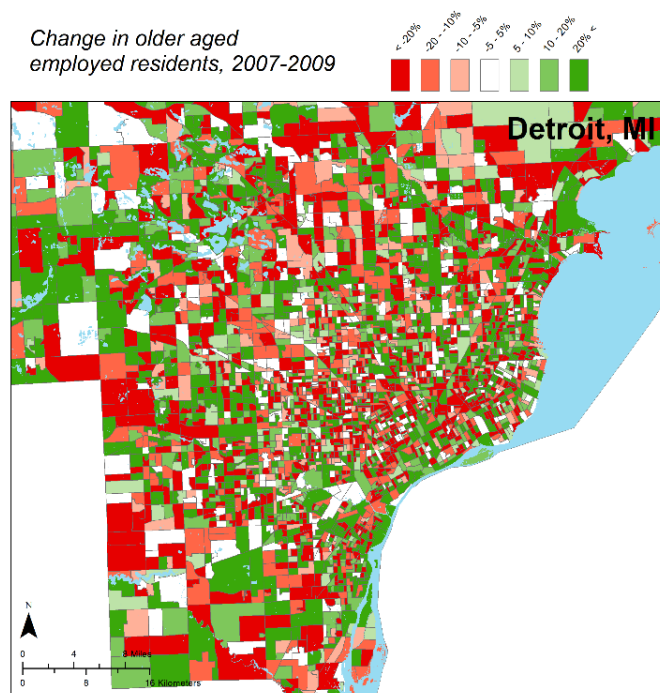


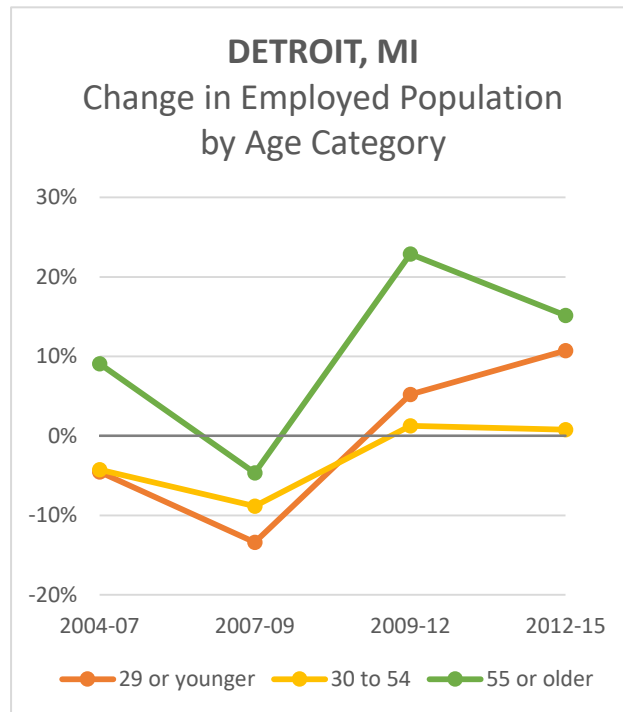
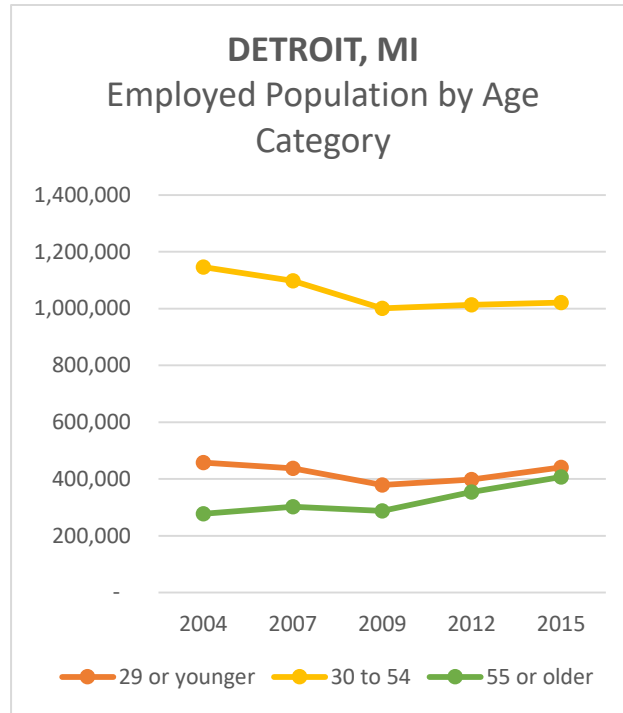


Change in middle aged
employed residents, 2007-2009

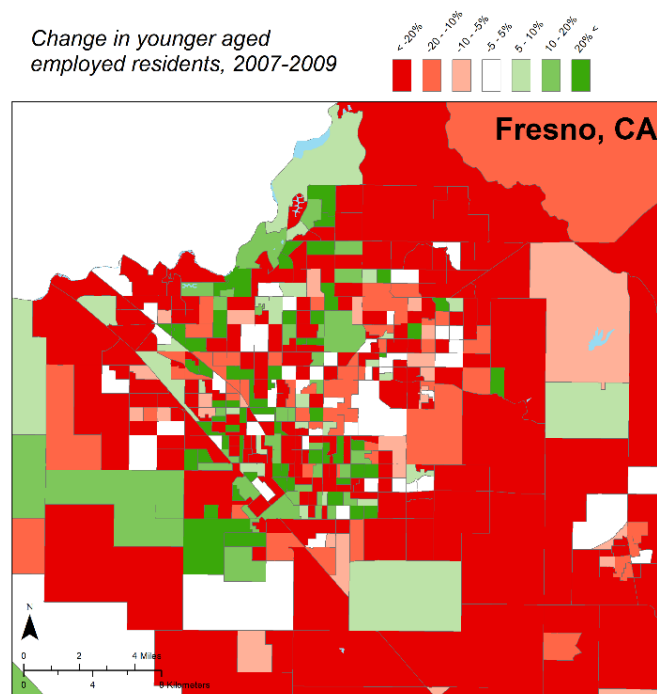


Change in older aged
employed residents, 2007-2009

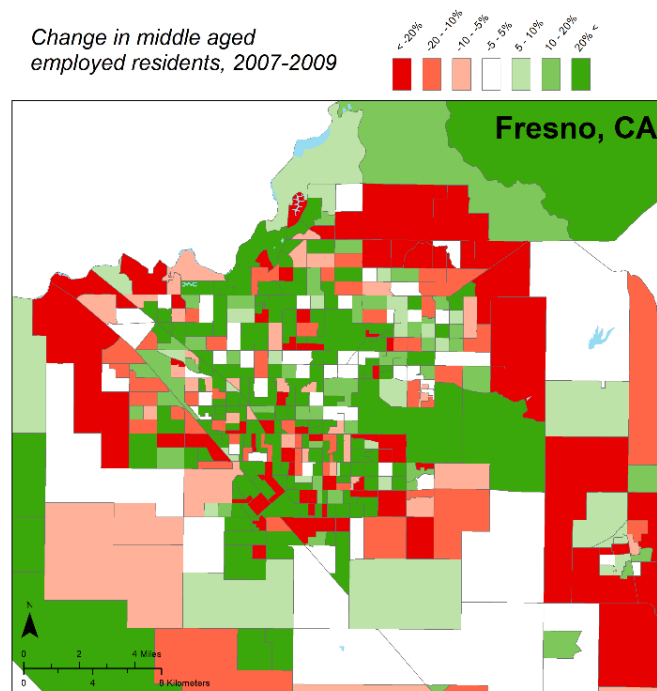




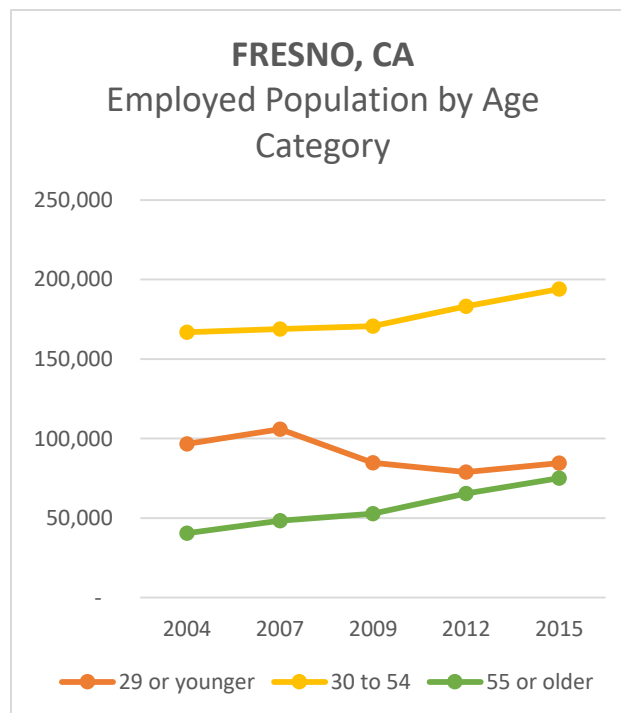
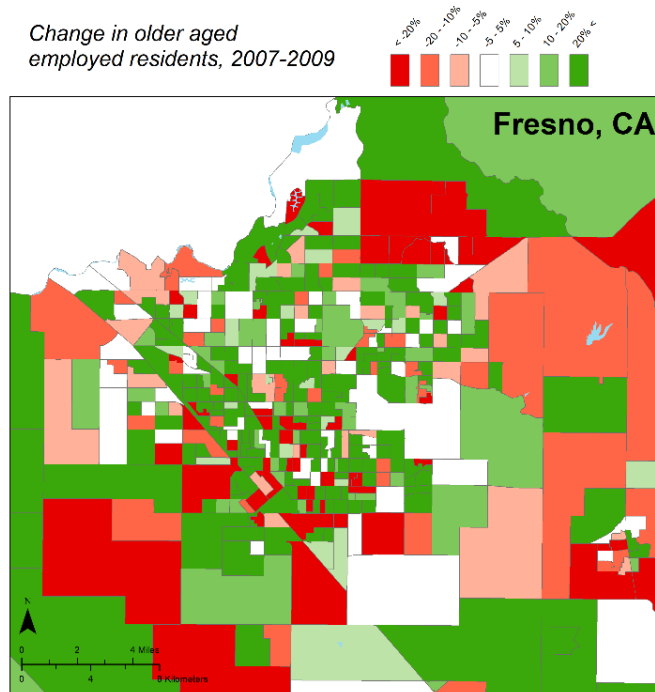
Change in younger aged
employed residents, 2007-2009

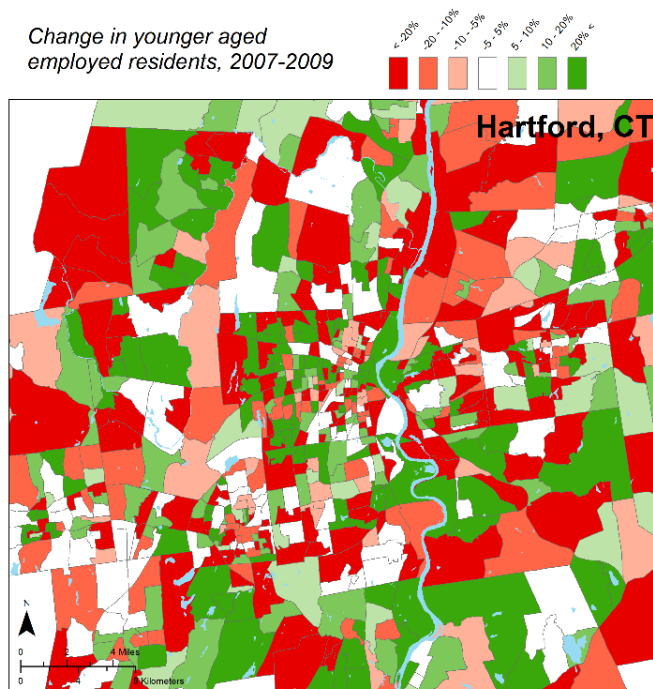
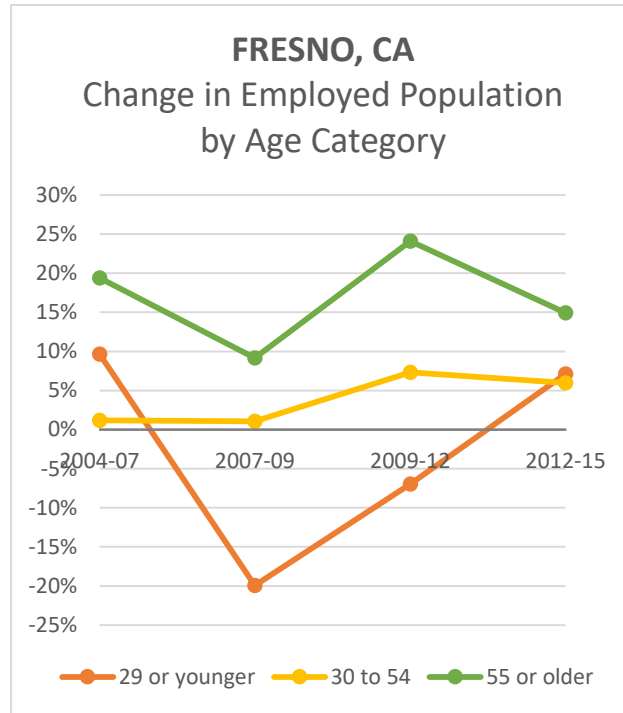


Change in middle aged
employed residents, 2007-2009

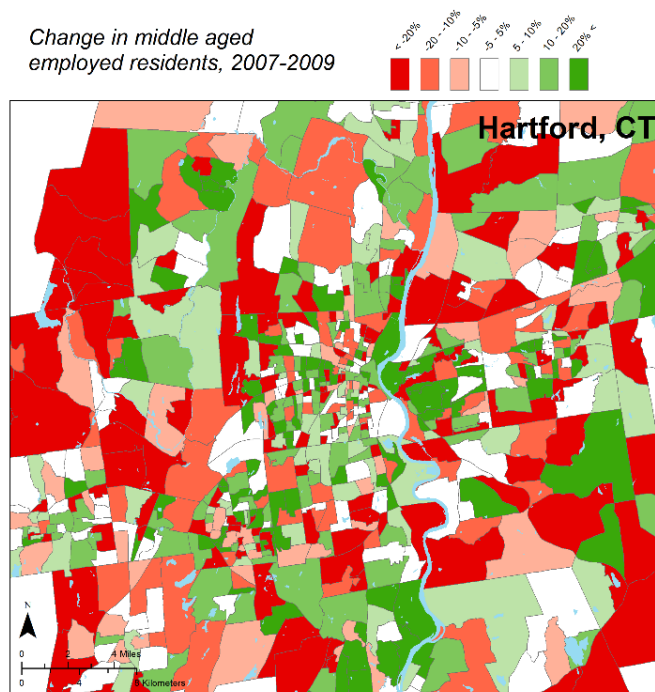


Change in older aged
employed residents, 2007-2009

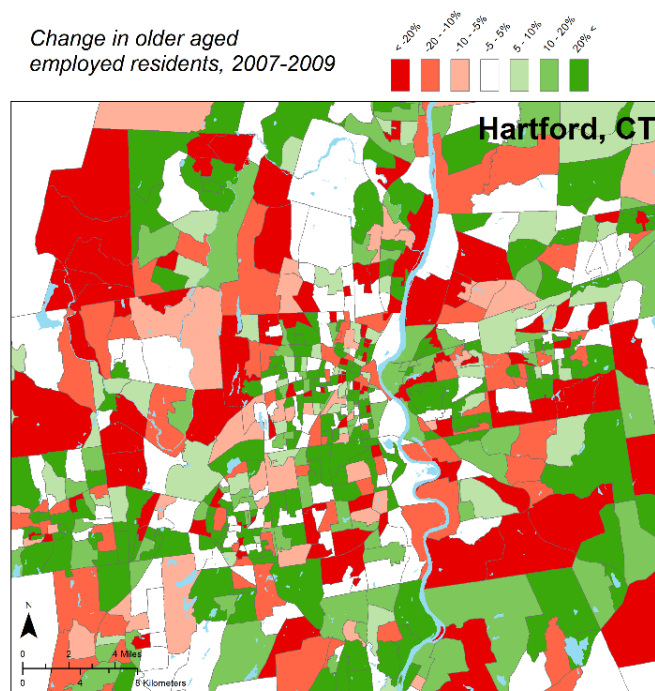


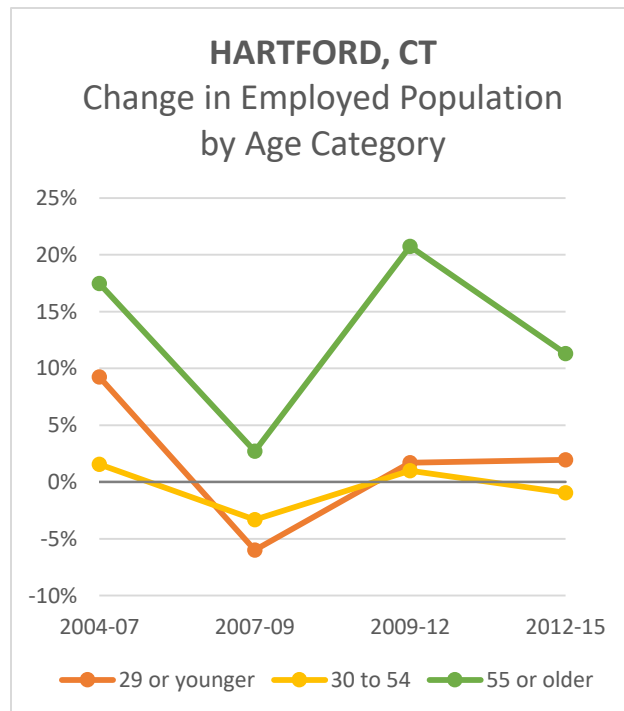
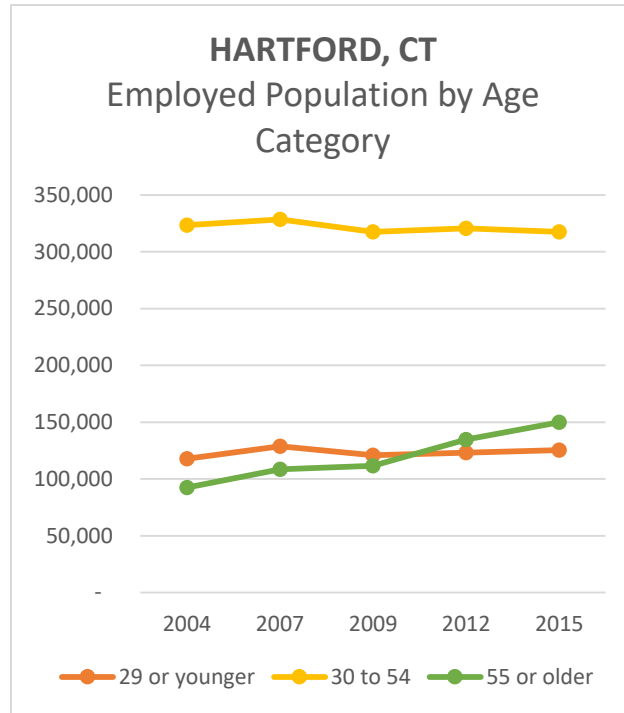


Change in middle aged
employed residents, 2007-2009

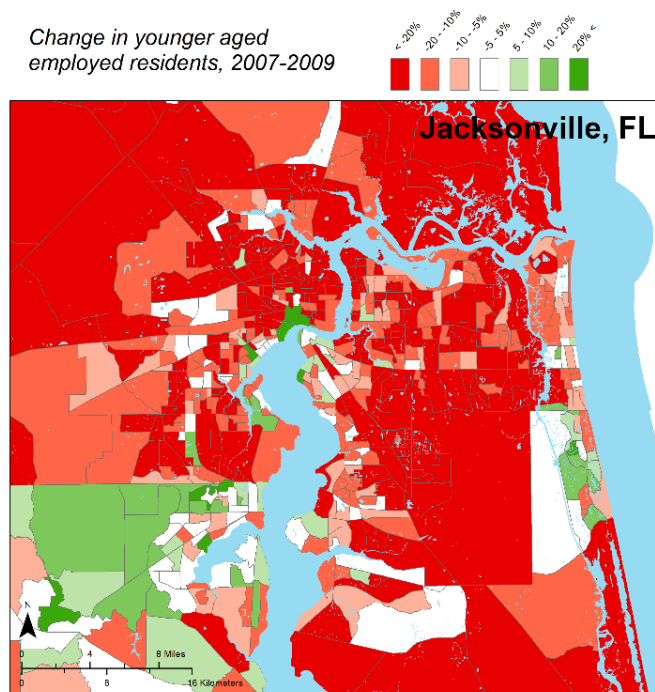


Change in older aged
employed residents, 2007-2009

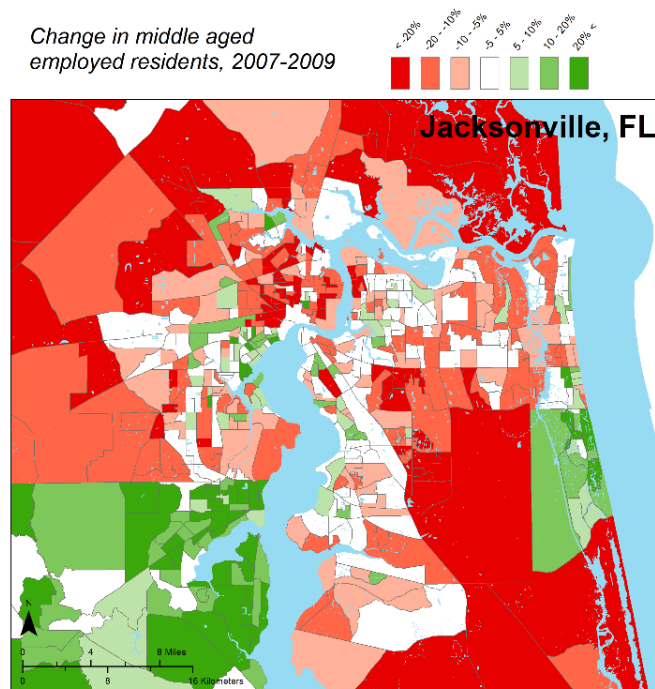




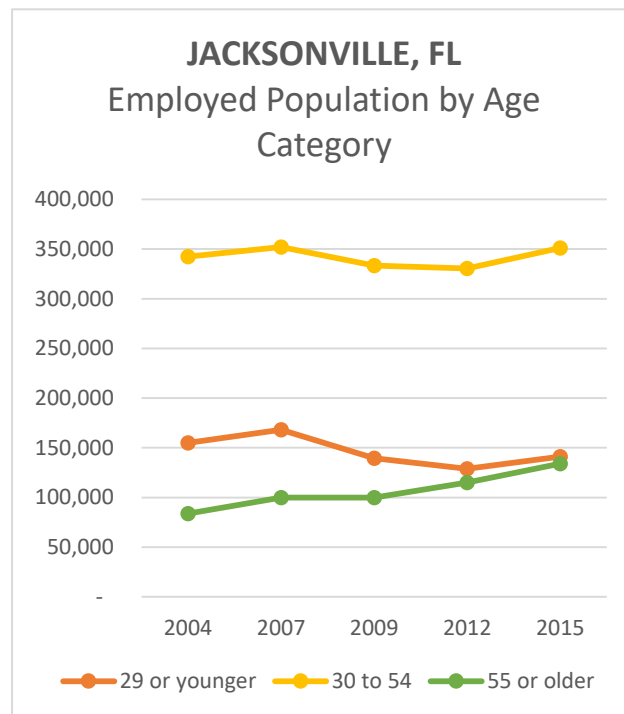
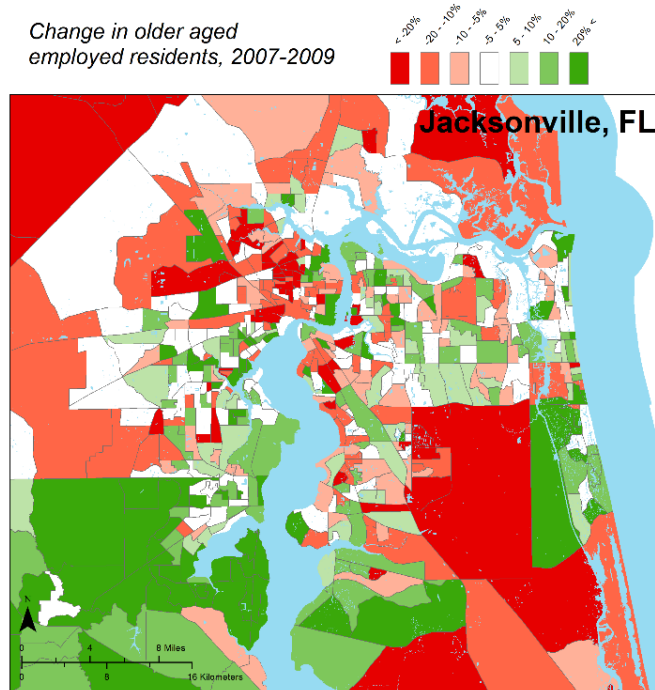
Change in younger aged
employed residents, 2007-2009

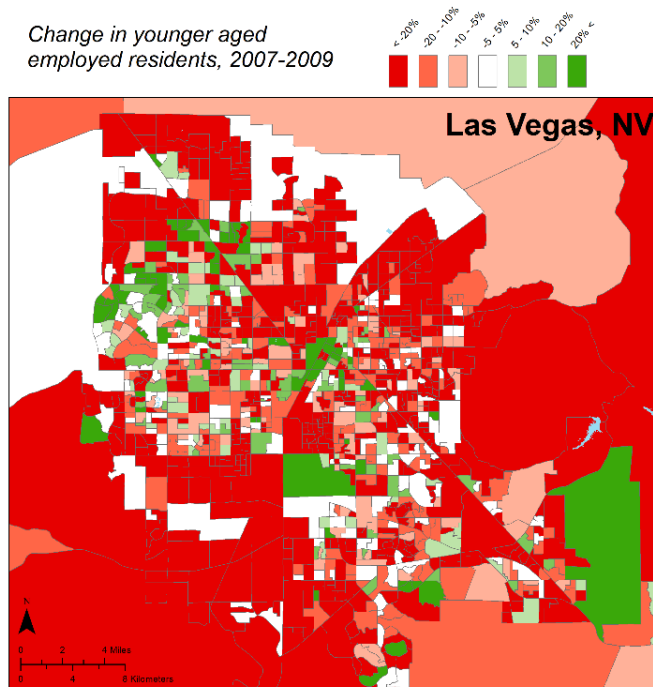
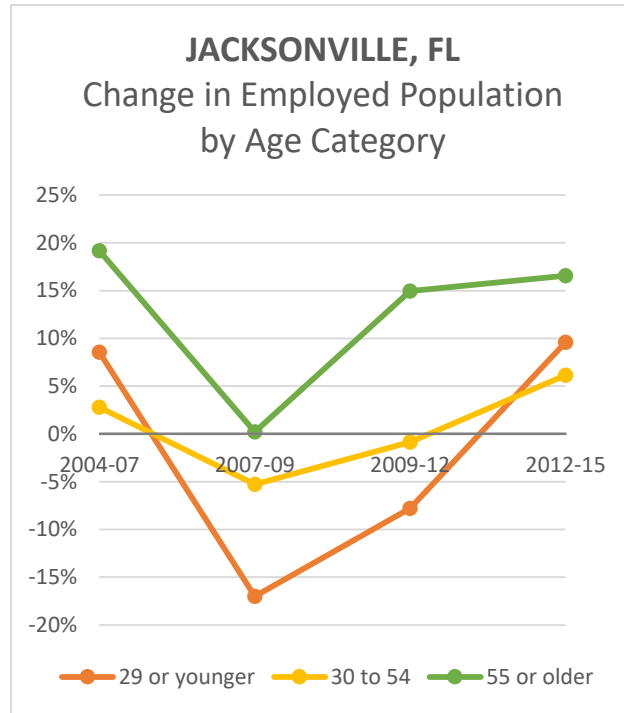


Change in middle aged
employed residents, 2007-2009

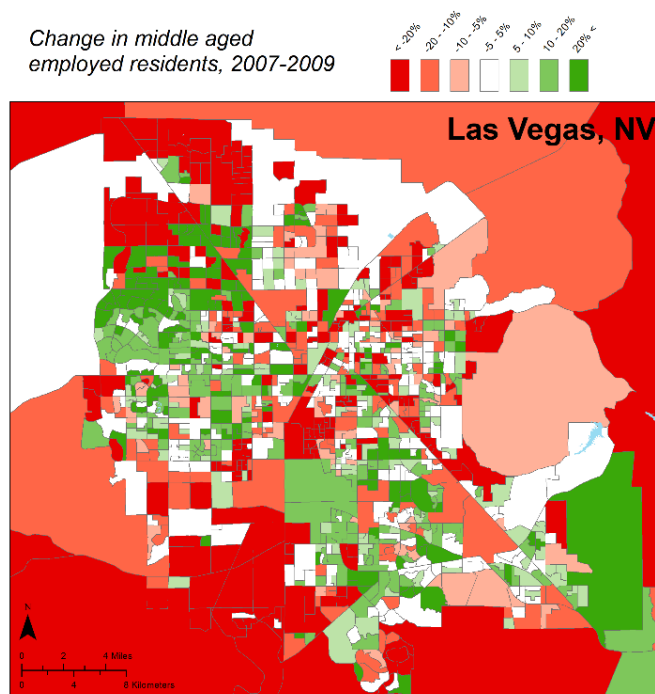


Change in older aged
employed residents, 2007-2009

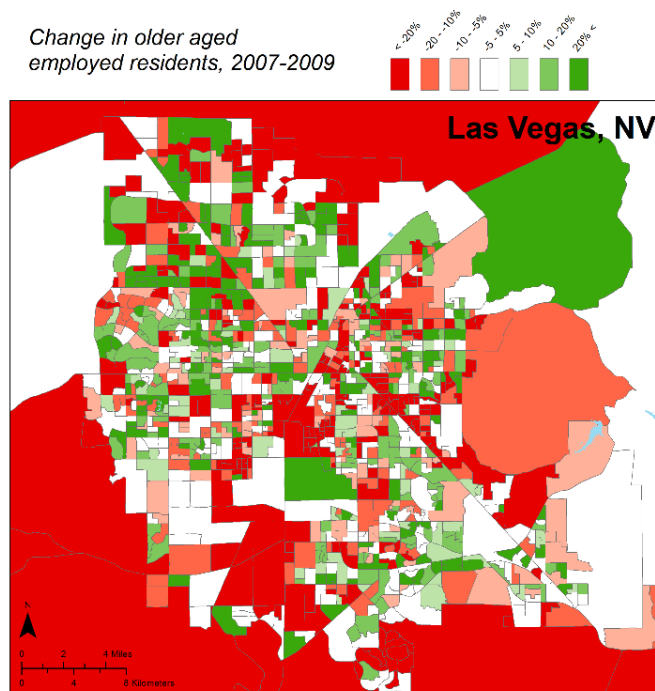


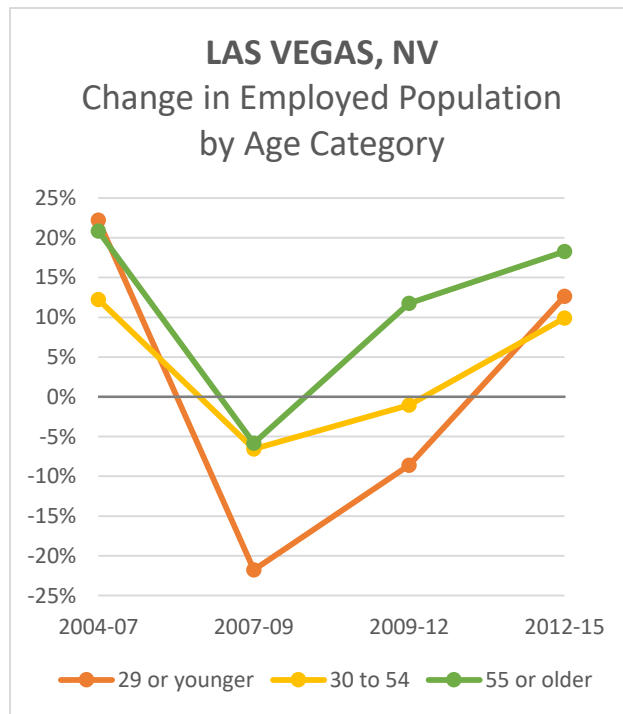
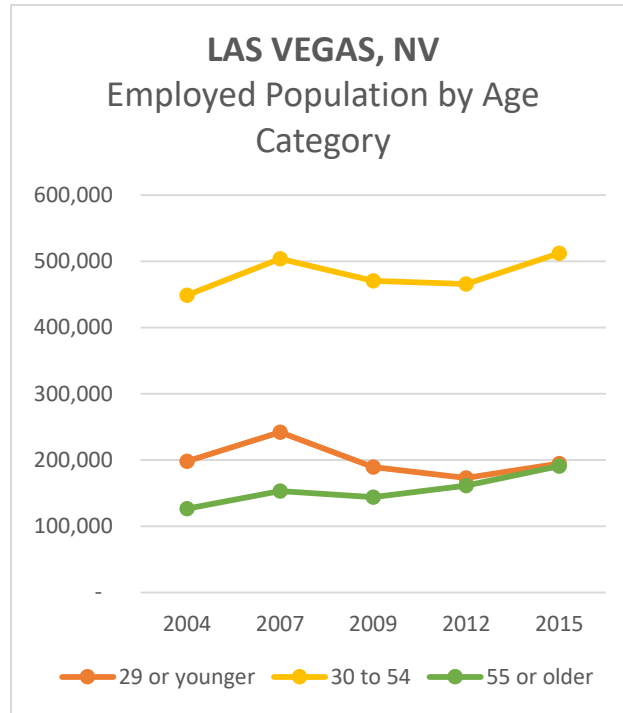


Change in middle aged
employed residents, 2007-2009

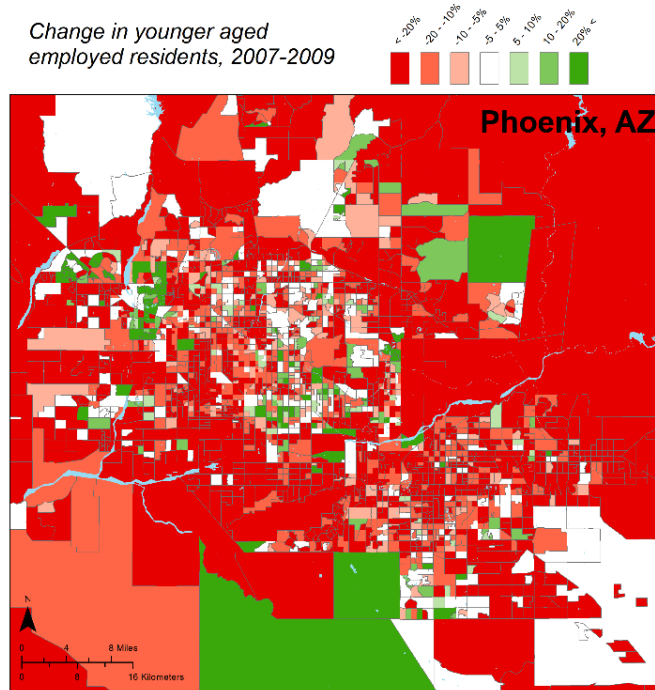


Change in older aged
employed residents, 2007-2009

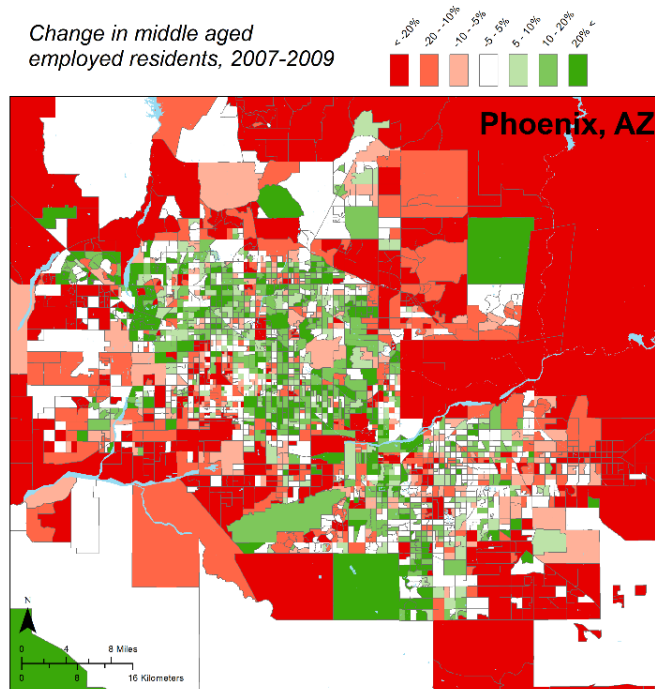


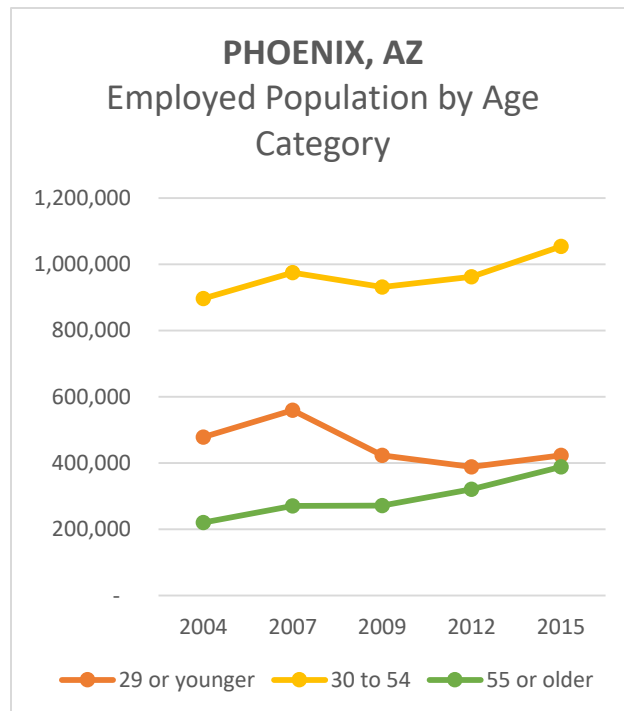
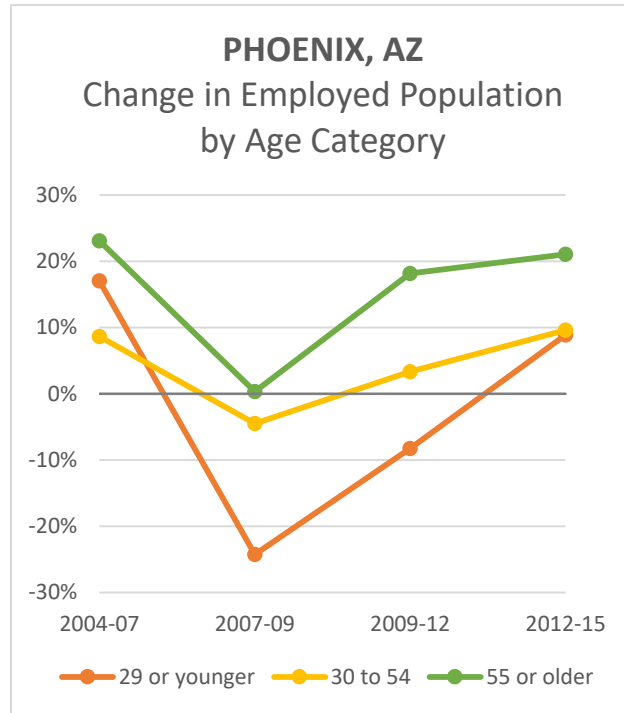


Change in younger aged
employed residents, 2007-2009

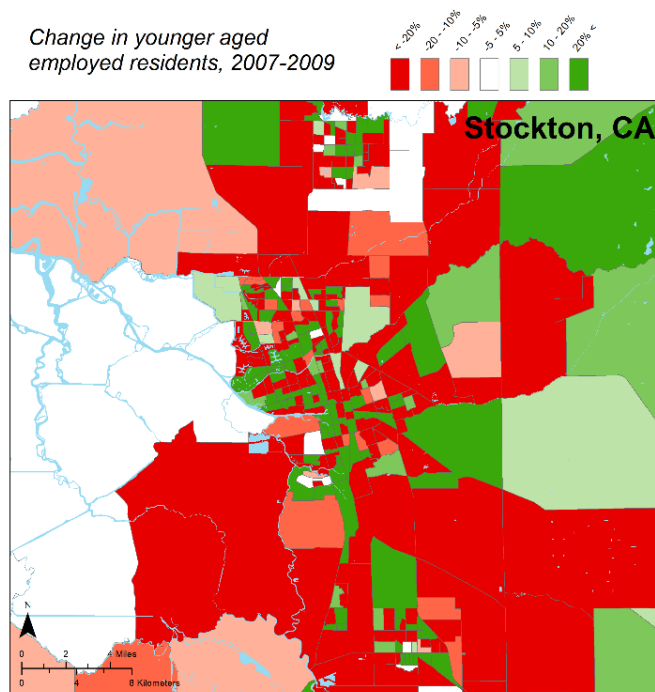


Change in middle aged
employed residents, 2007-2009

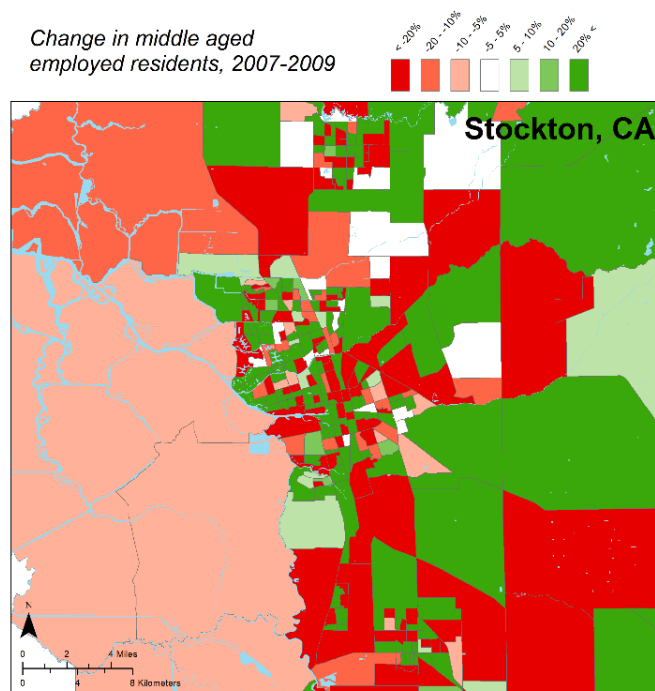




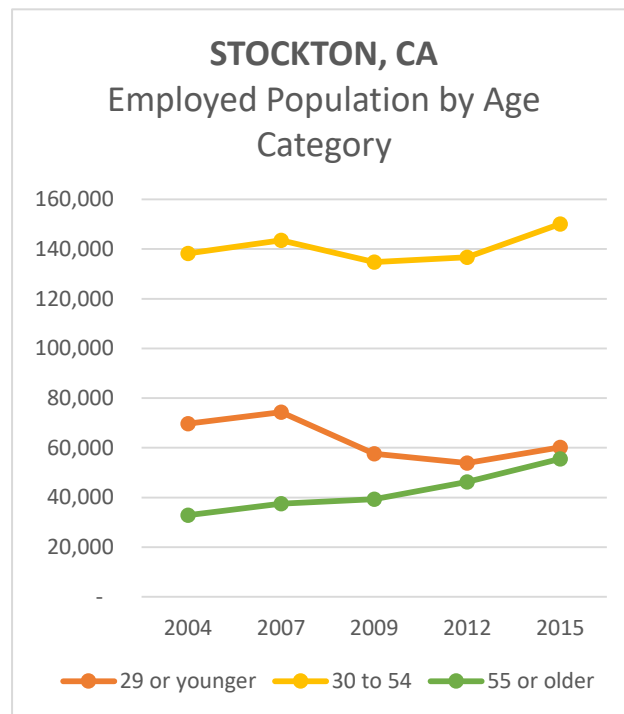
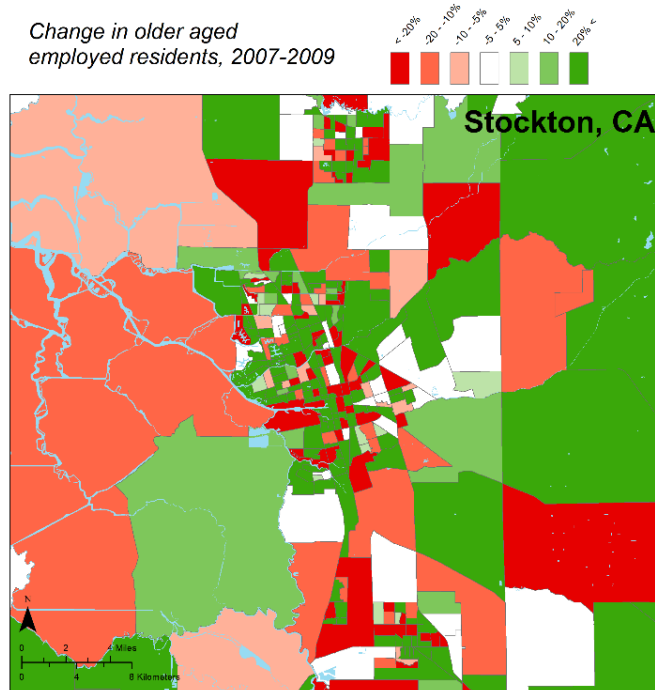
Change in younger aged
employed residents, 2007-2009

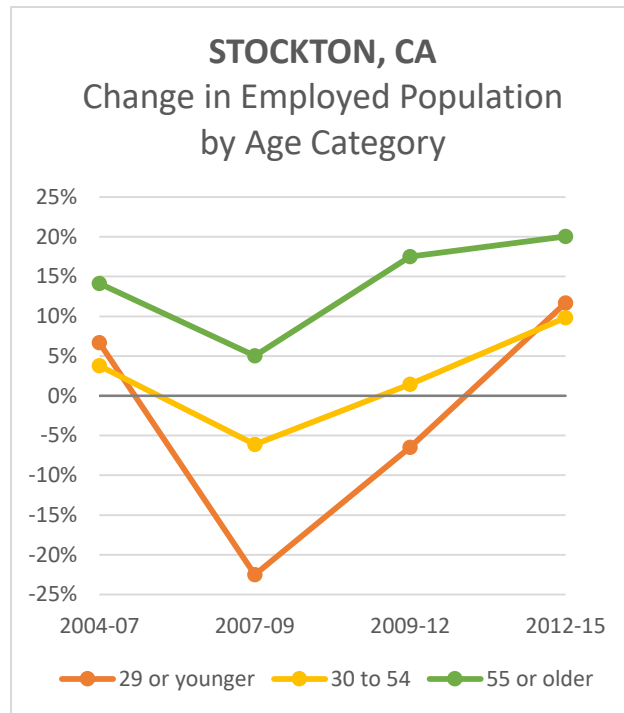


Change in middle aged
employed residents, 2007-2009



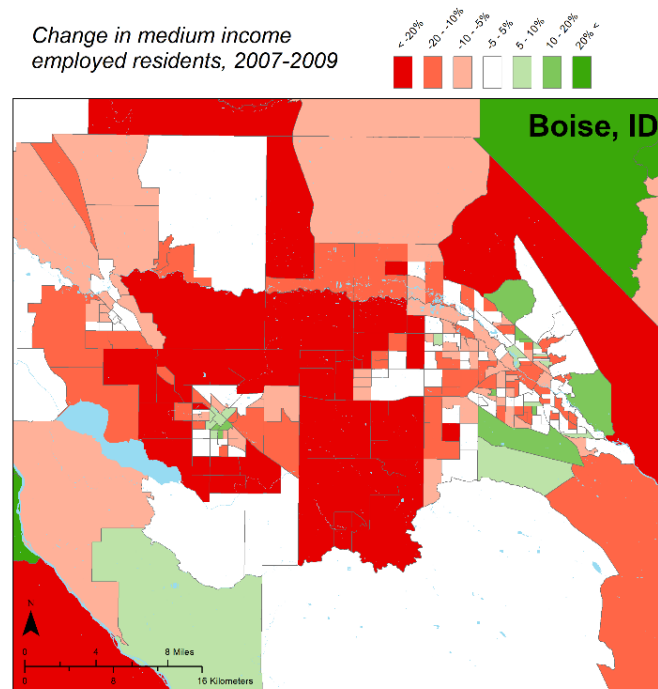
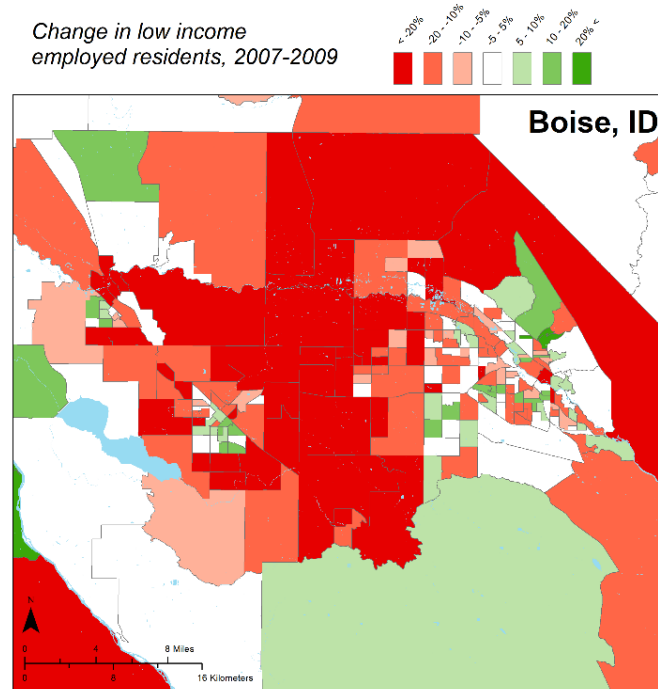
Change in older aged
employed residents, 2007-2009



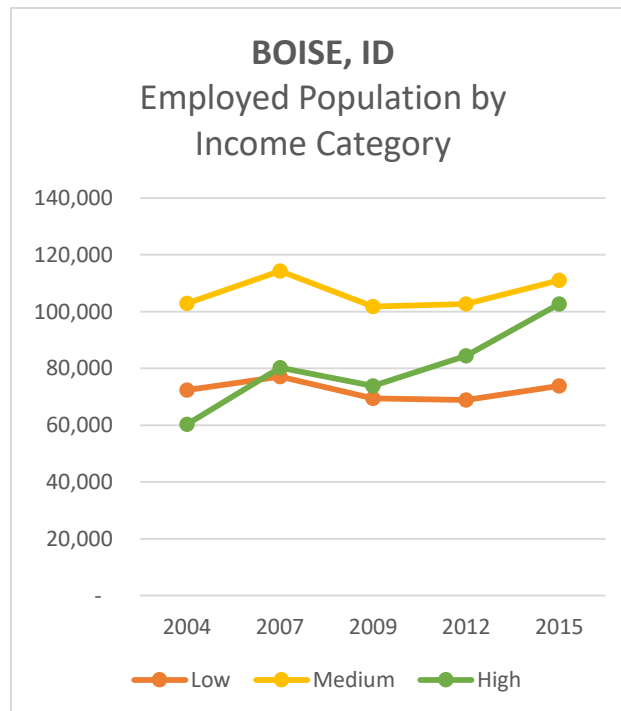
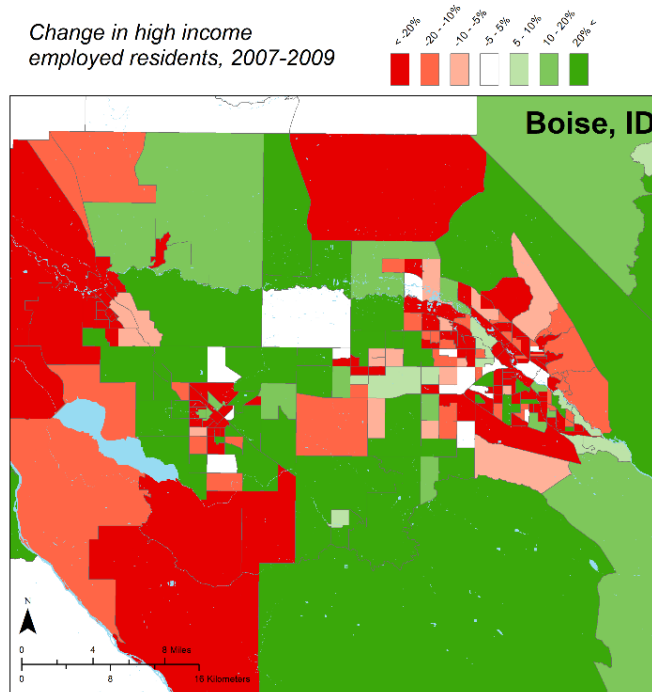


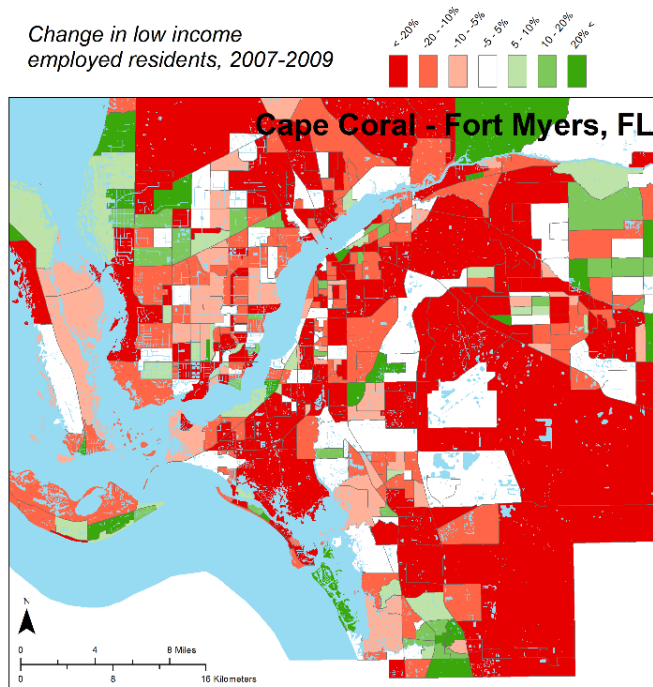
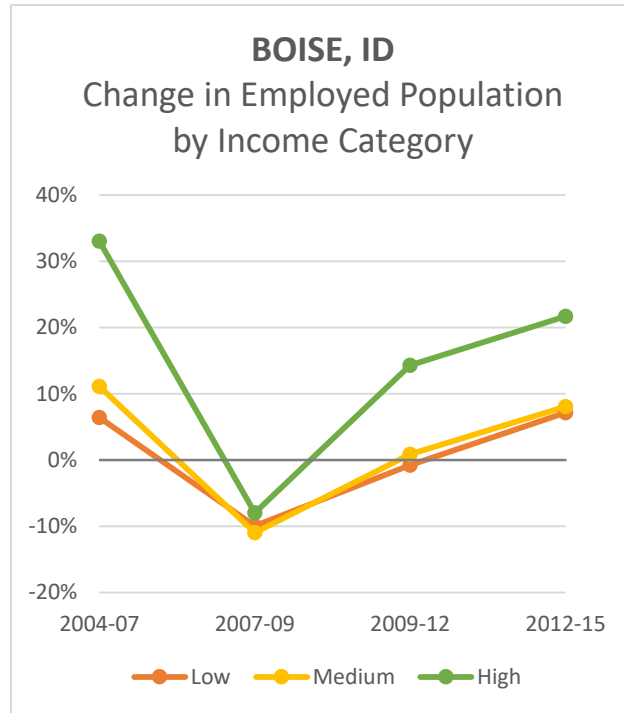
APPENDIX D

Maps and charts of change in employed residents by income

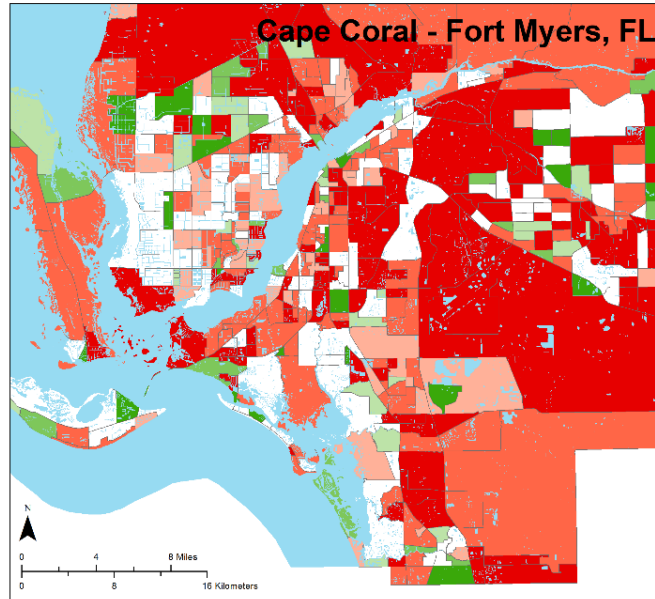
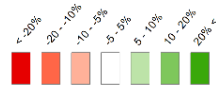


Change in high income
employed residents, 2007-2009

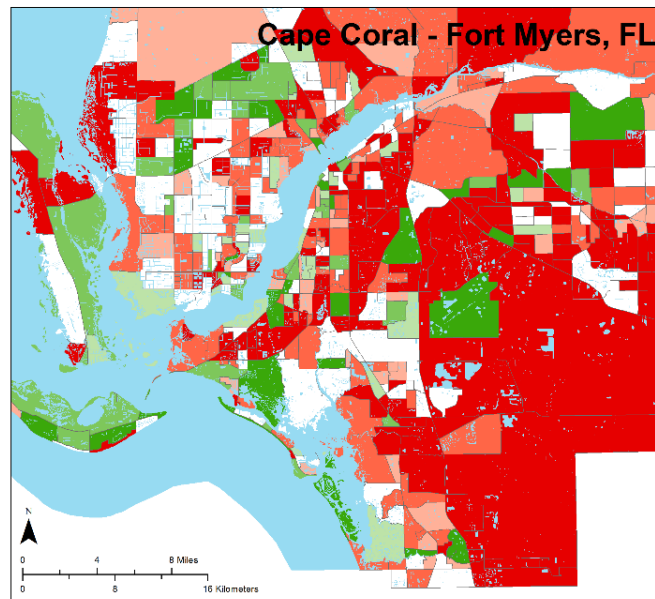
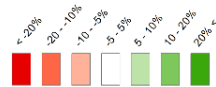


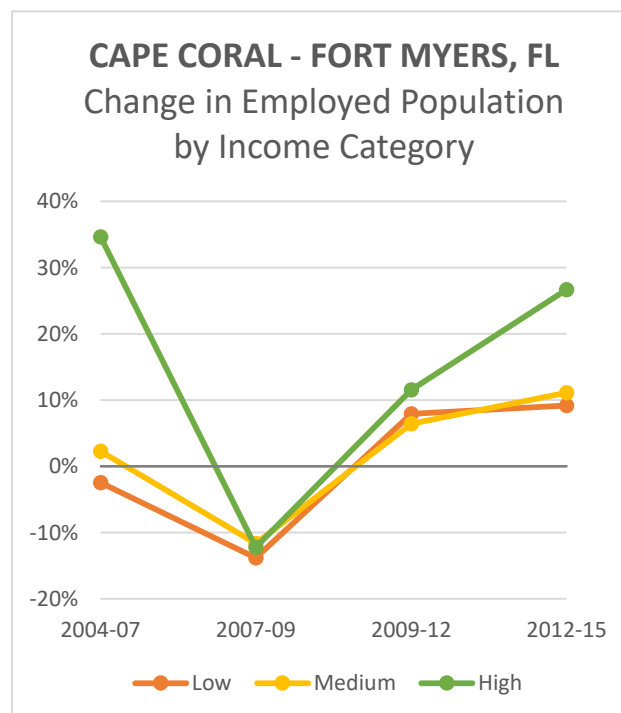
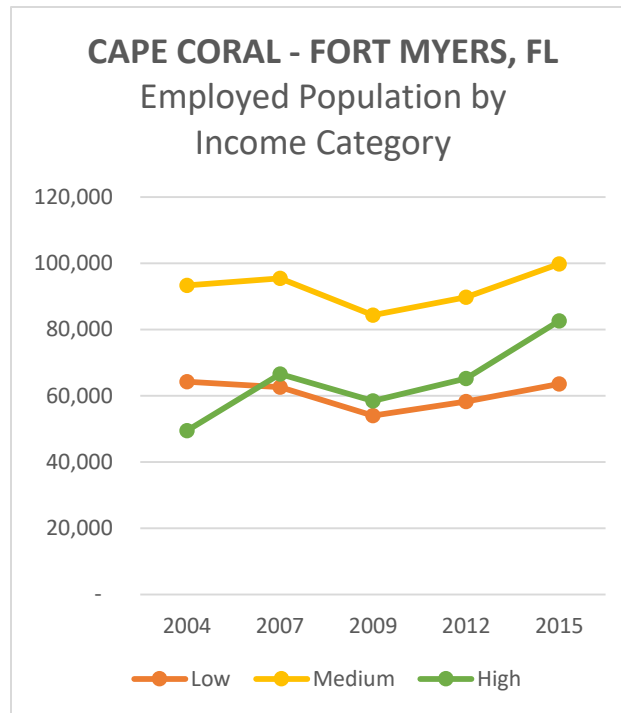


Change in medium income
employed residents, 2007-2009

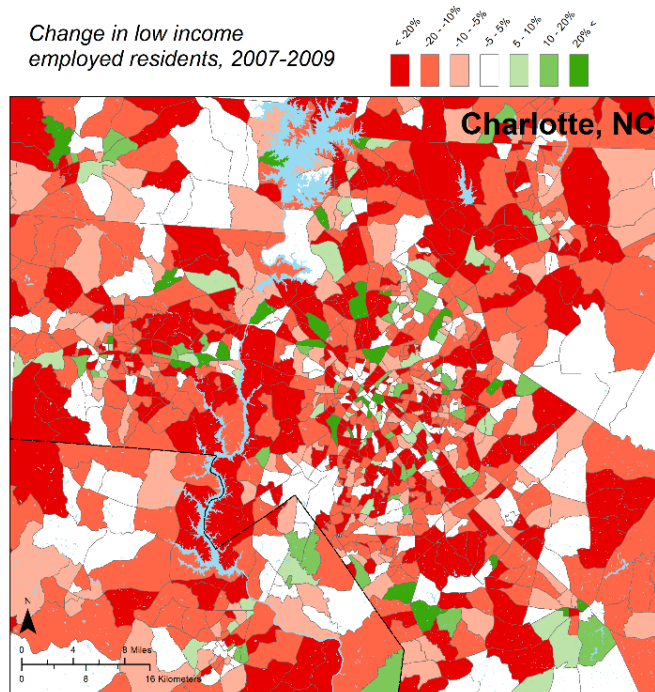


Change in high income
employed residents, 2007-2009

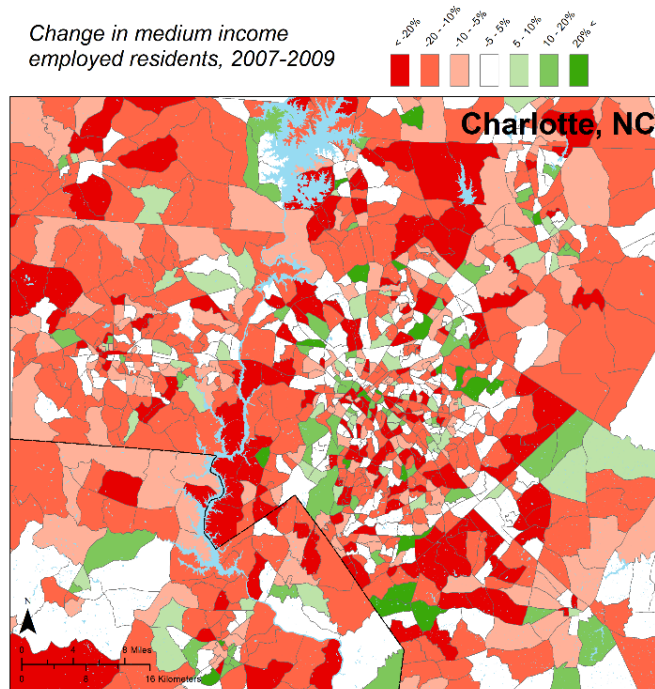




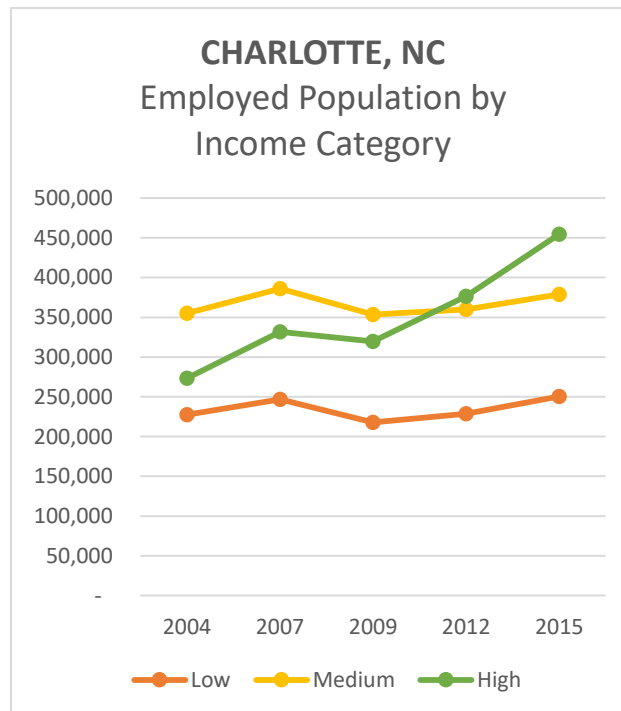
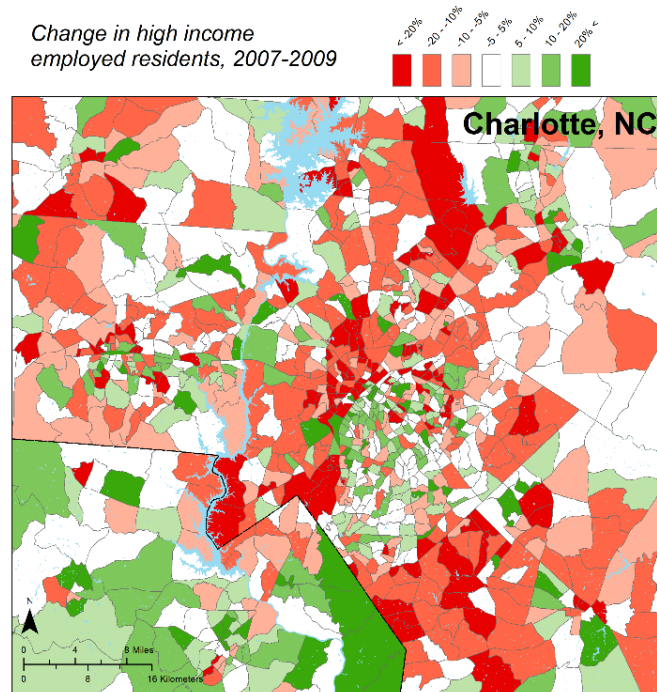
Change in low income
employed residents, 2007-2009

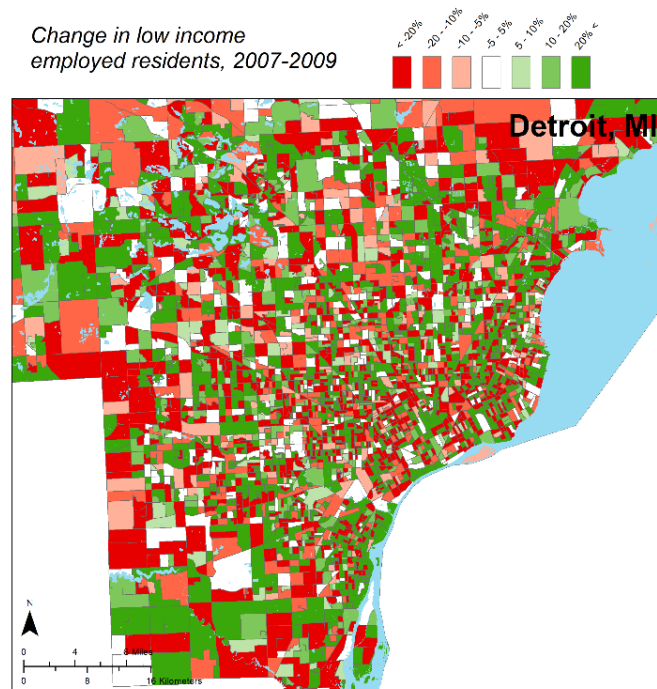
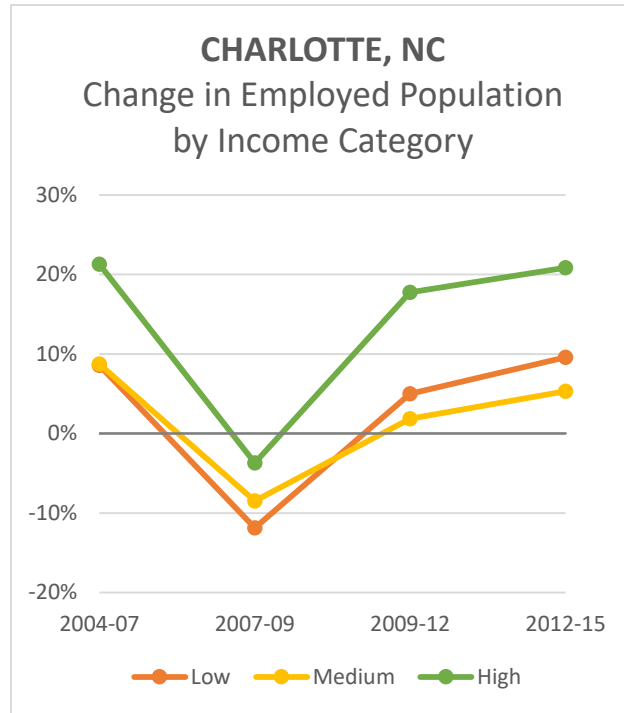


Change in medium income
employed residents, 2007-2009

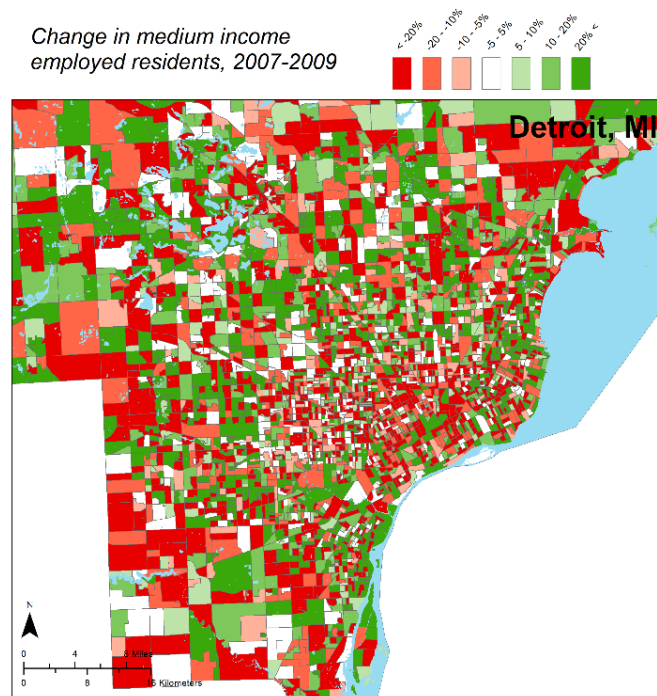


Change in high income
employed residents, 2007-2009

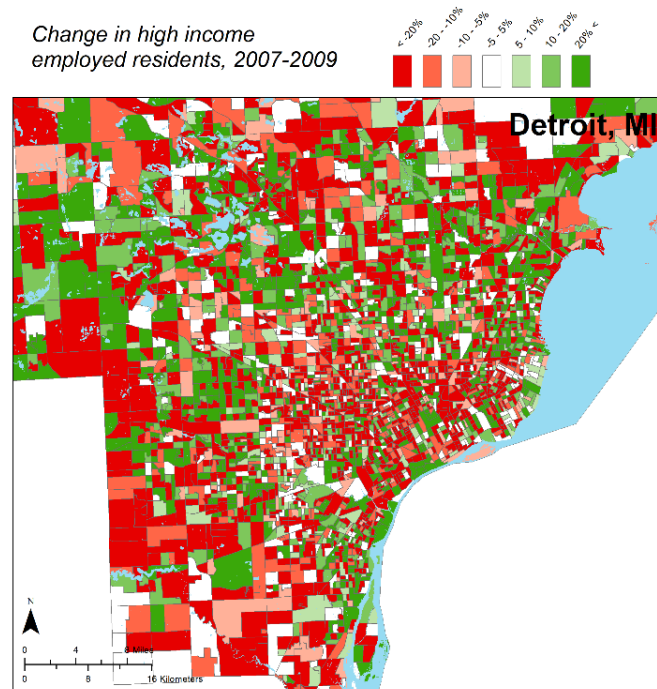


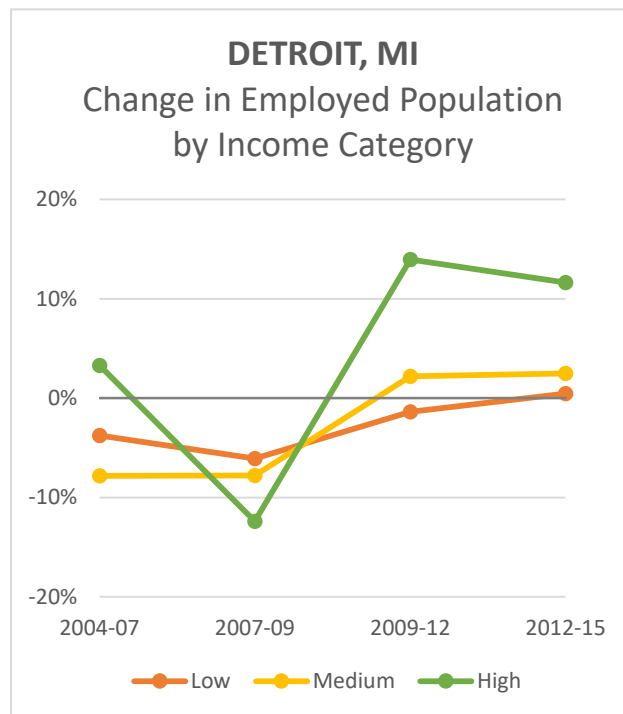
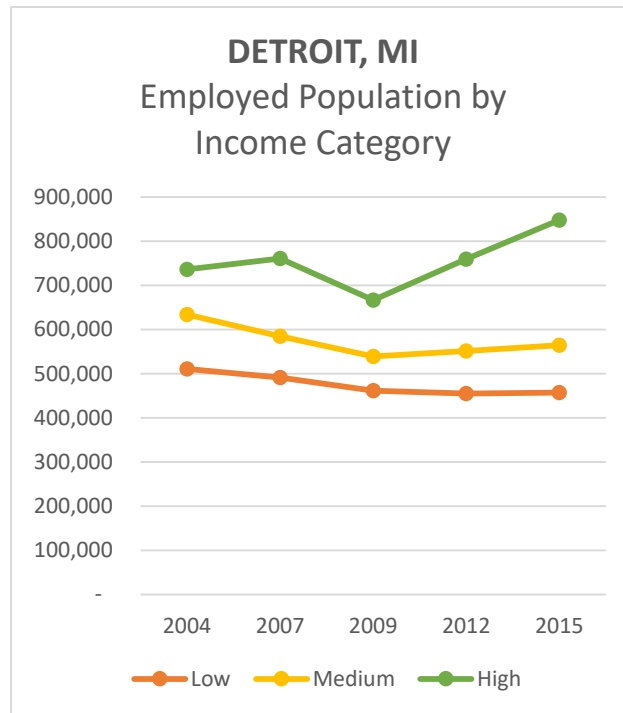


Change in medium income
employed residents, 2007-2009

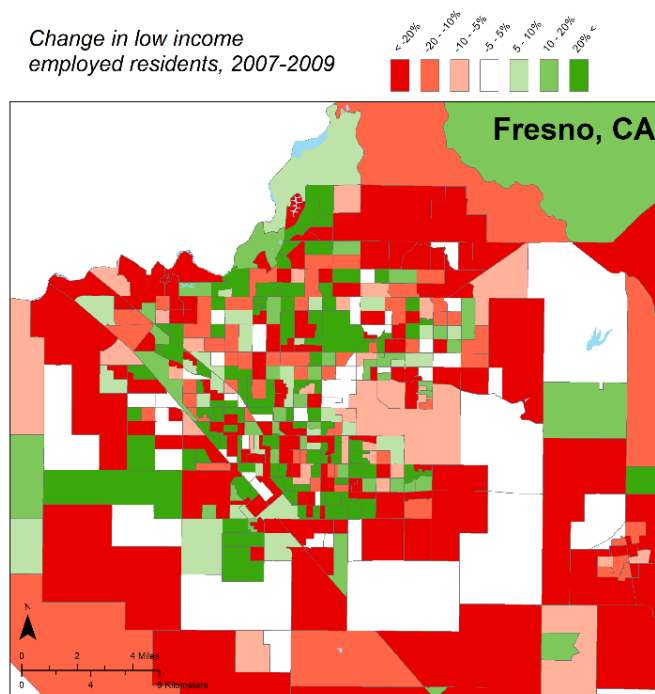


Change in high income
employed residents, 2007-2009

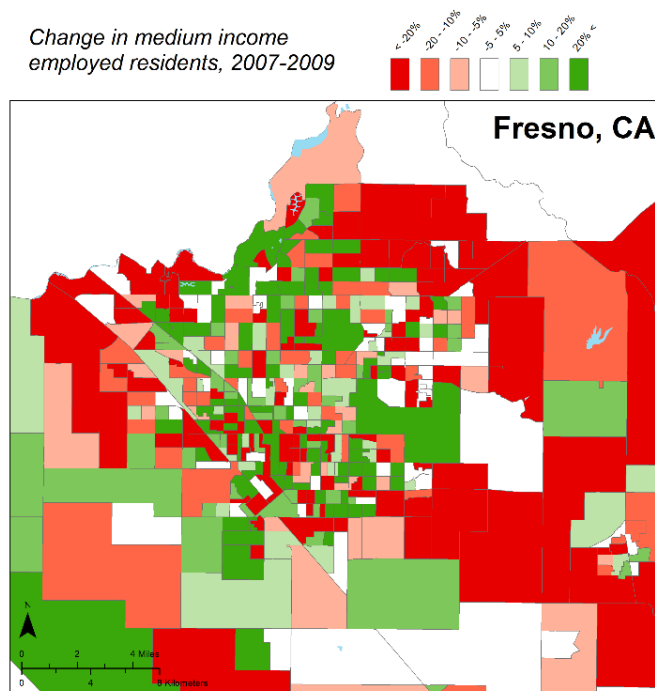




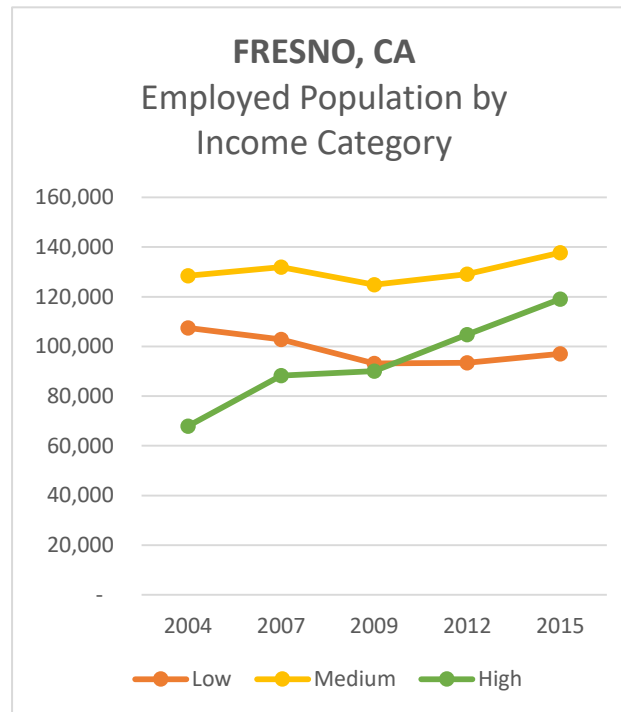
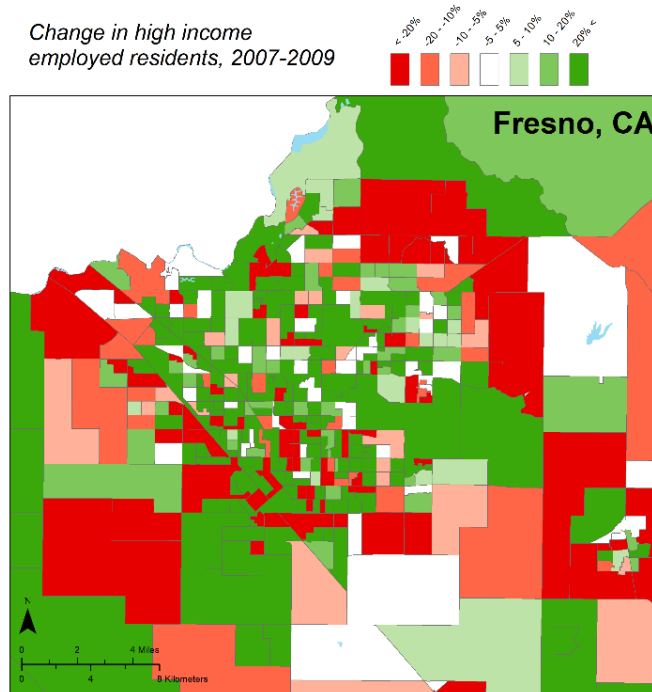
Change in low income
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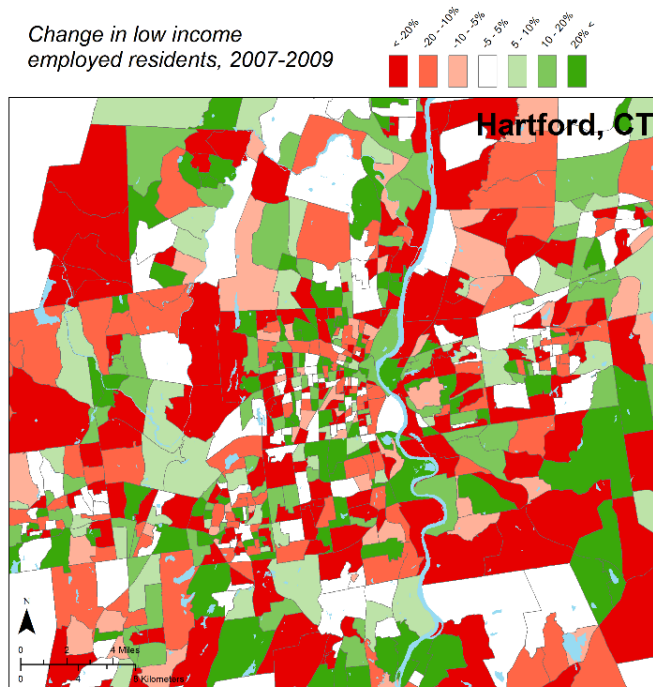
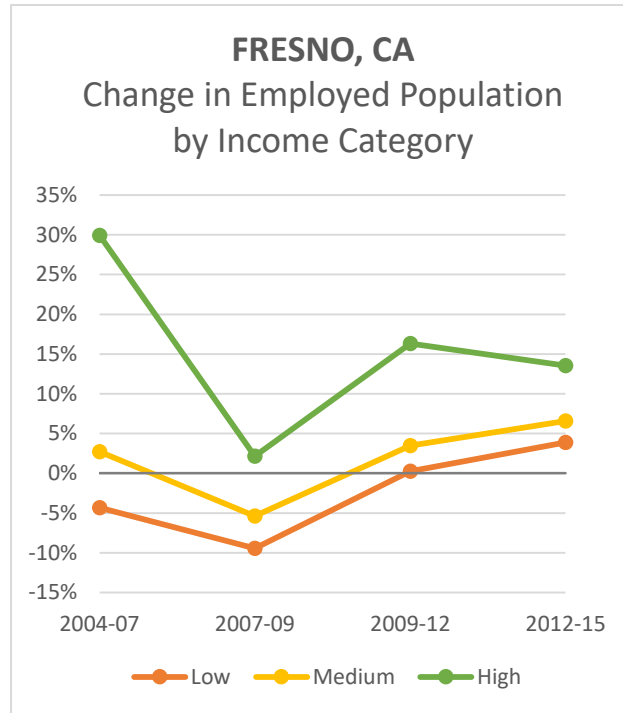


Change in medium income
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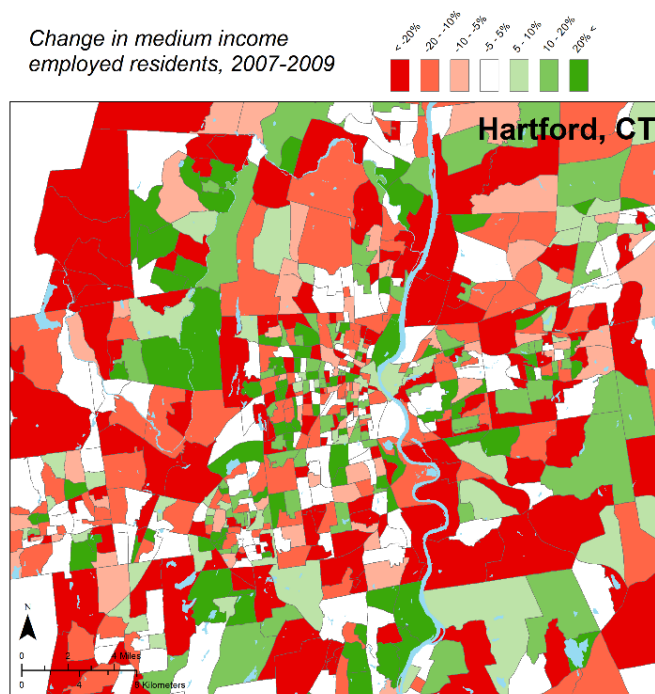


Change in high income
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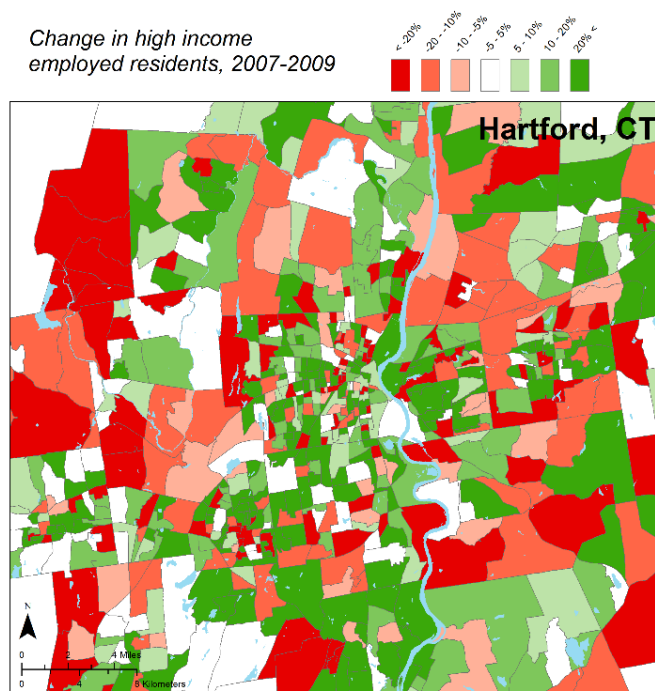


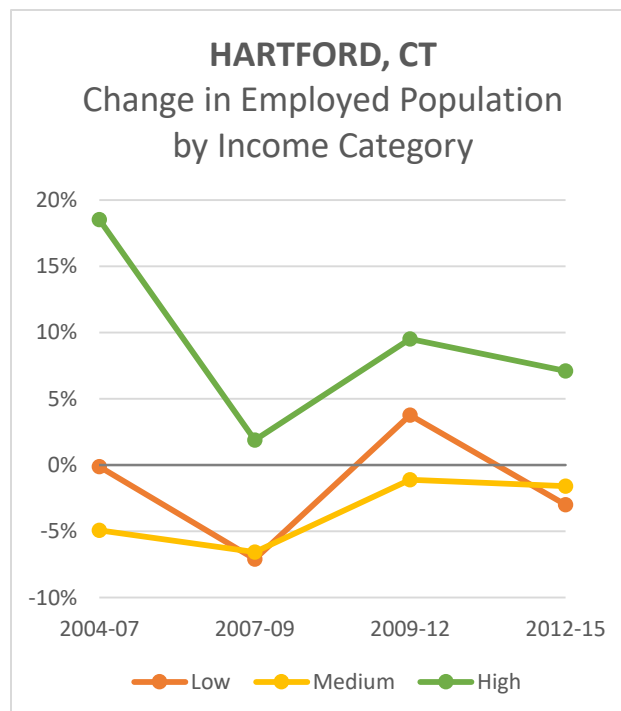
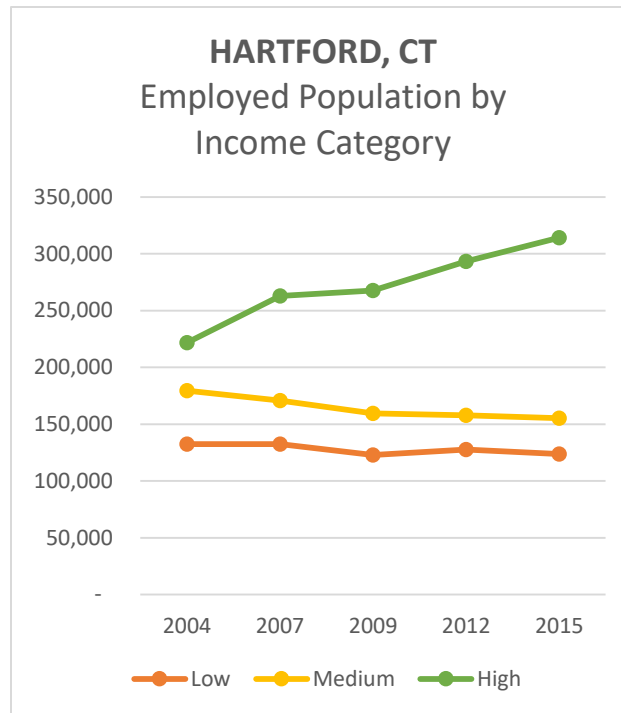


Change in medium income
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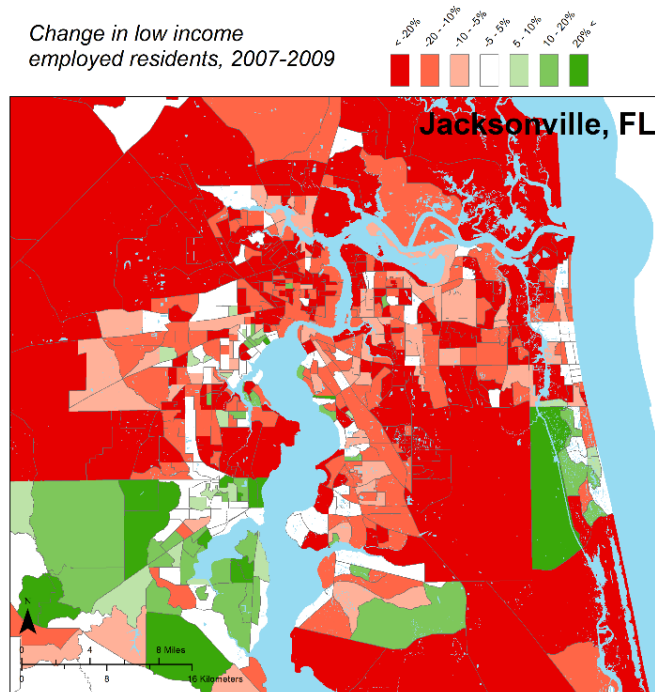


Change in high income
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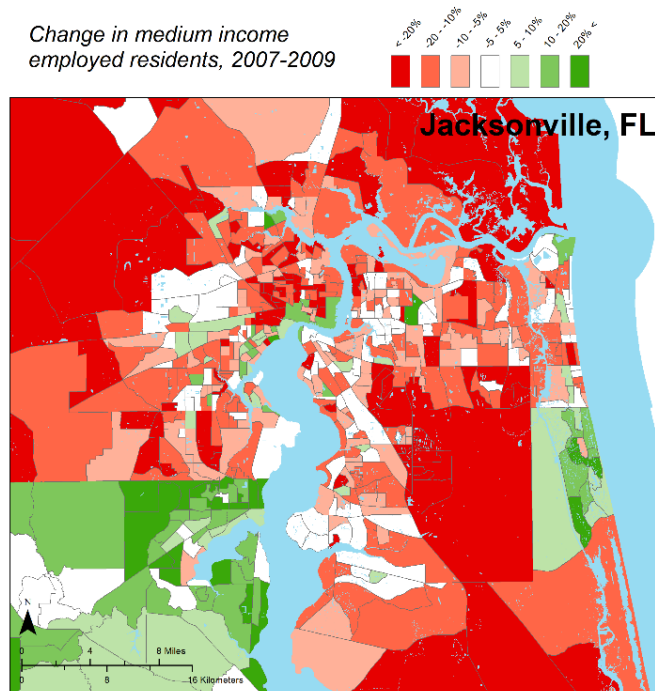




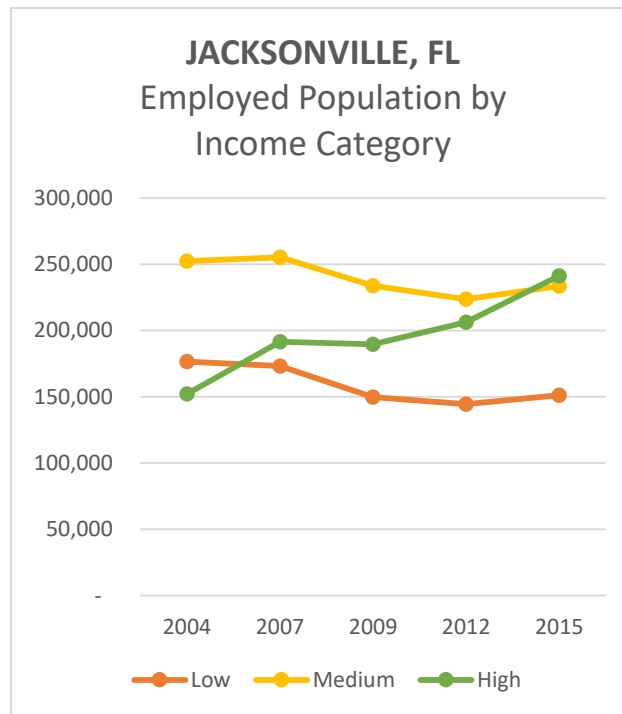
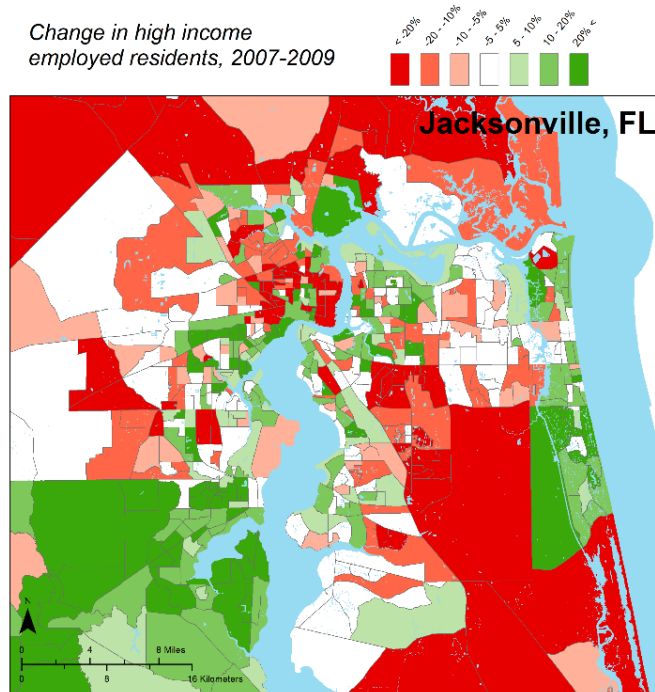
Change in low income
employed residents, 2007-2009

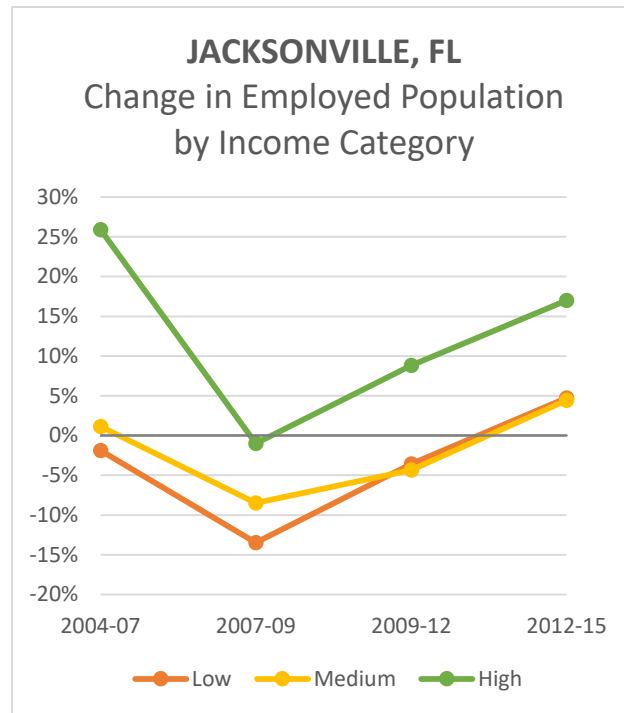


Change in medium income
employed residents, 2007-2009

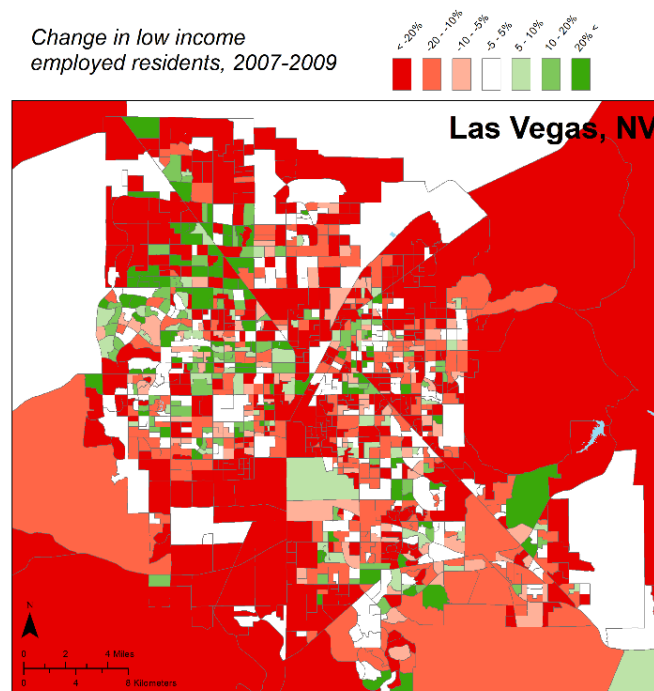


Change in high income
employed residents, 2007-2009

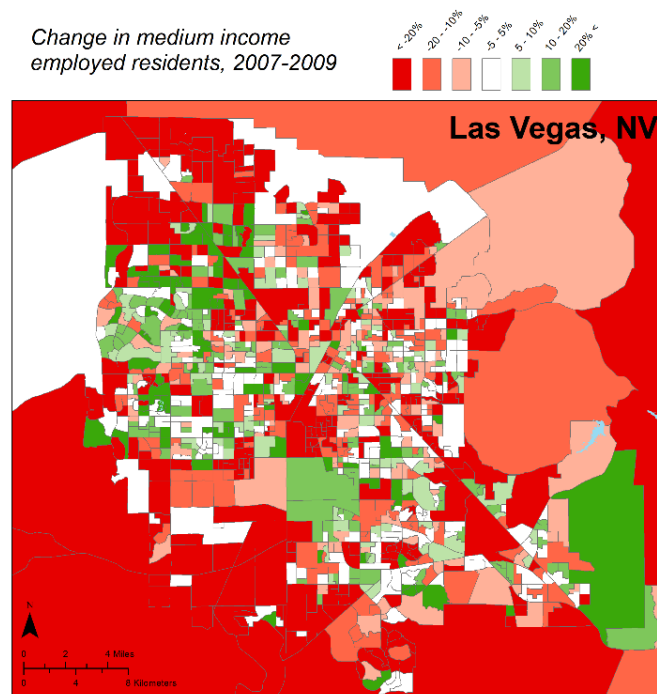




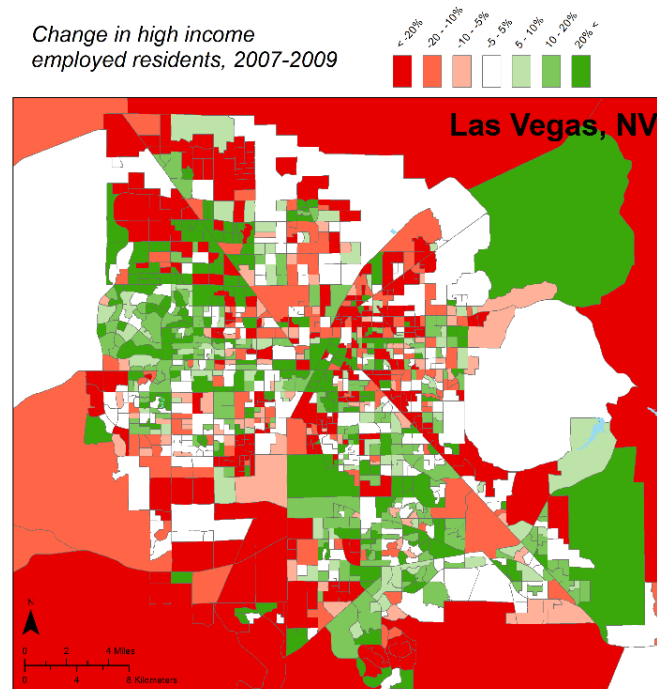
*Change in low income
employed residents, 2007-2009*

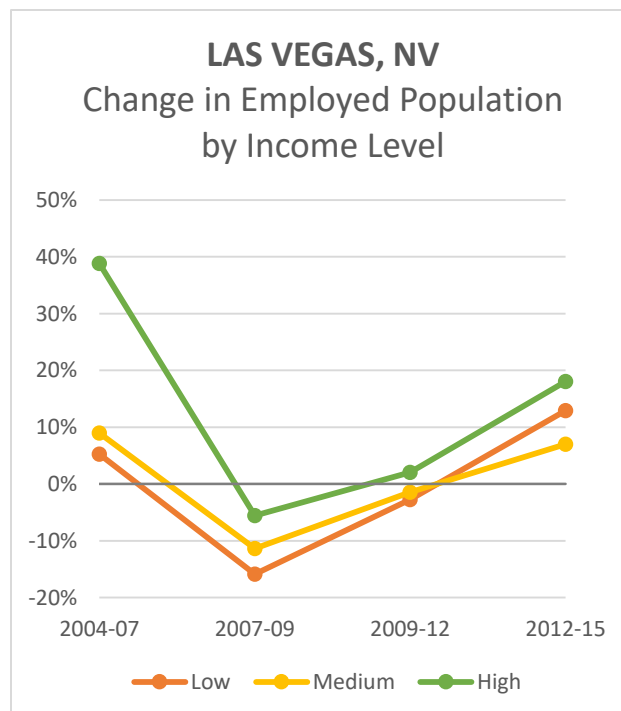
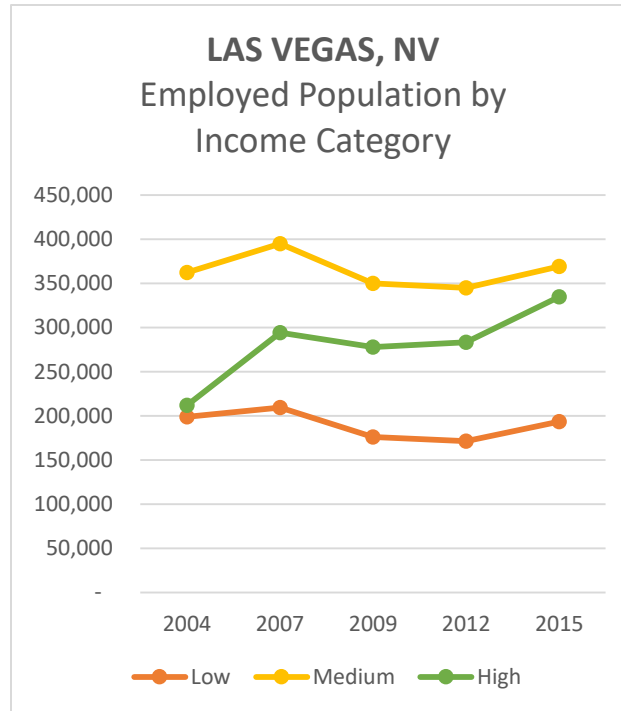


Change in medium income
employed residents, 2007-2009

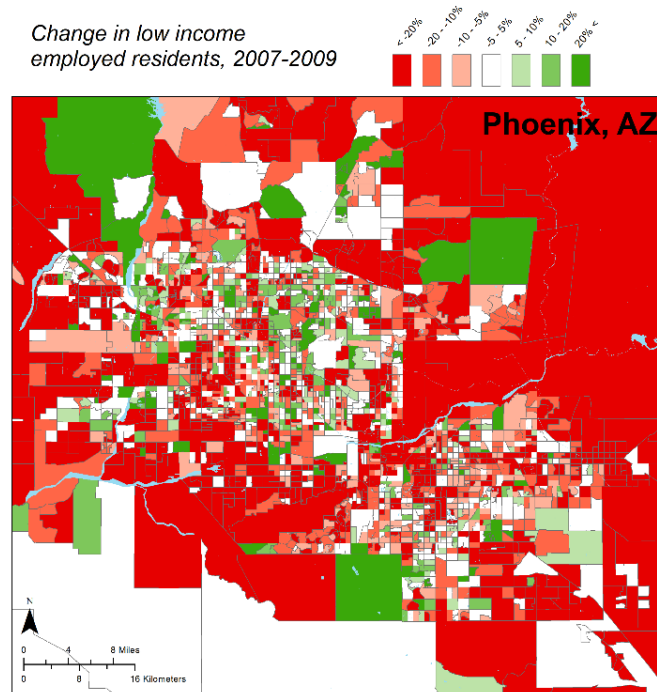


Change in high income
employed residents, 2007-2009

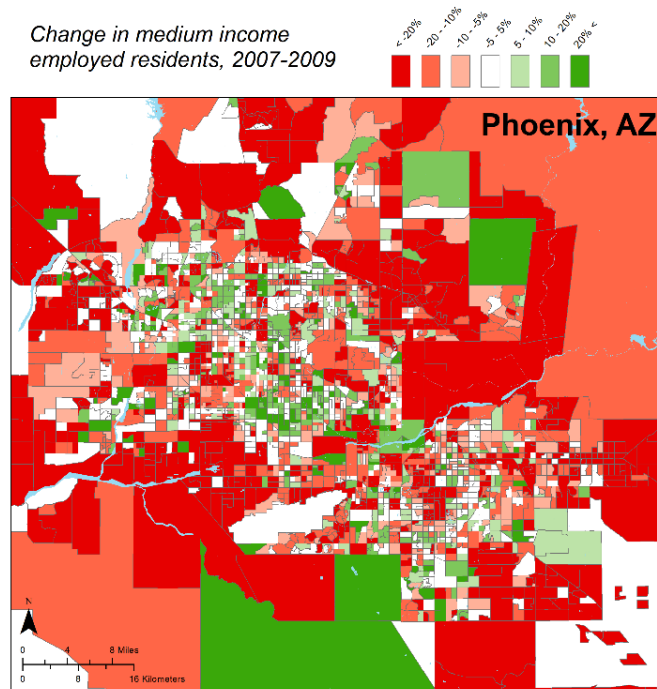




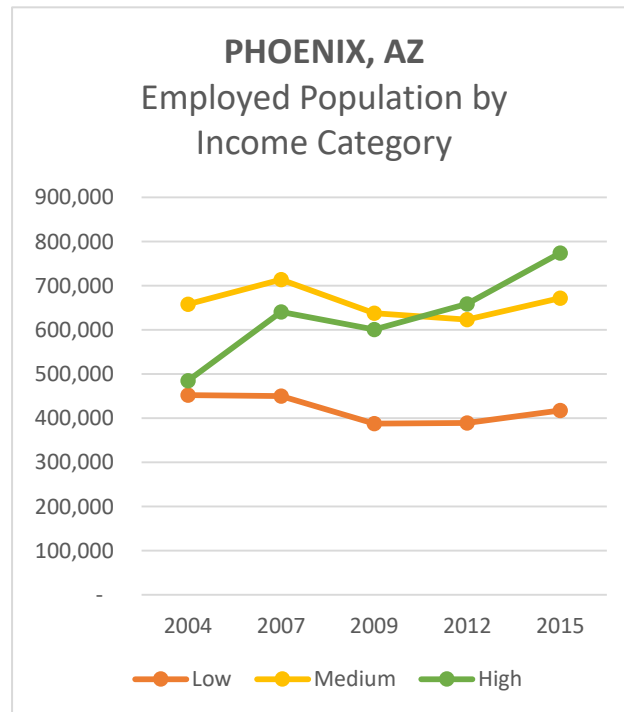
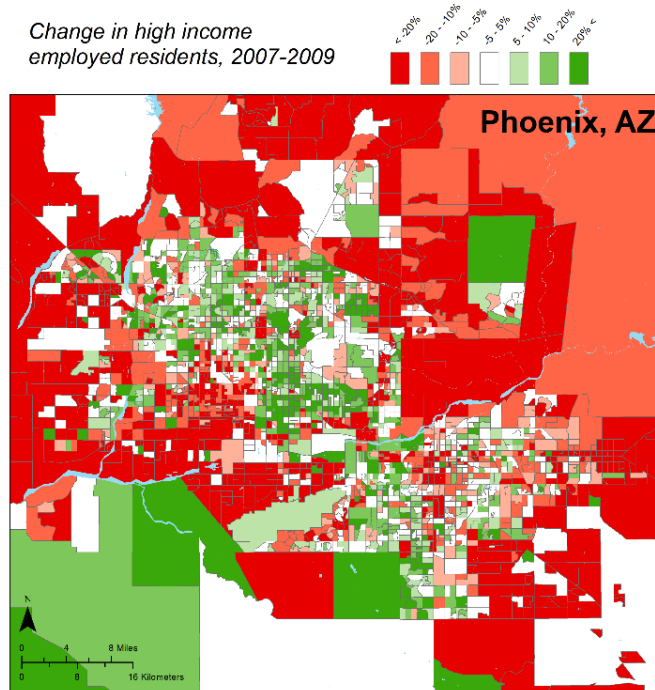
Change in low income
employed residents, 2007-2009

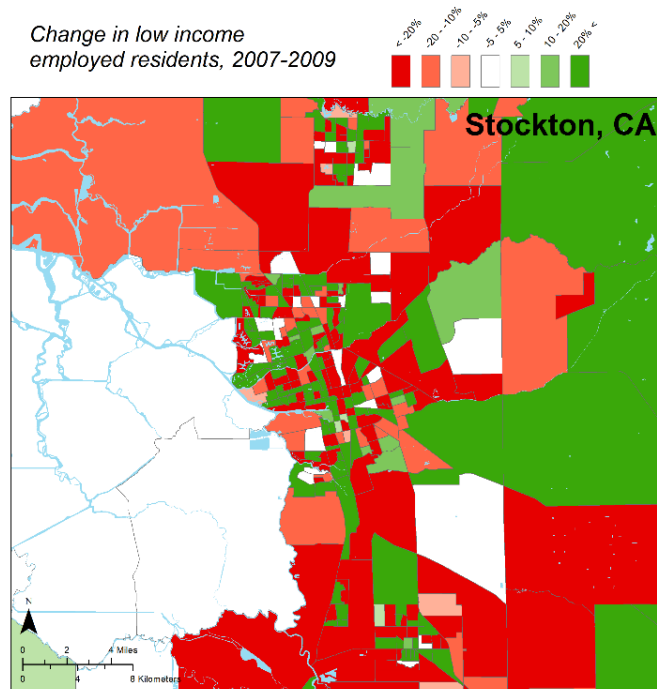
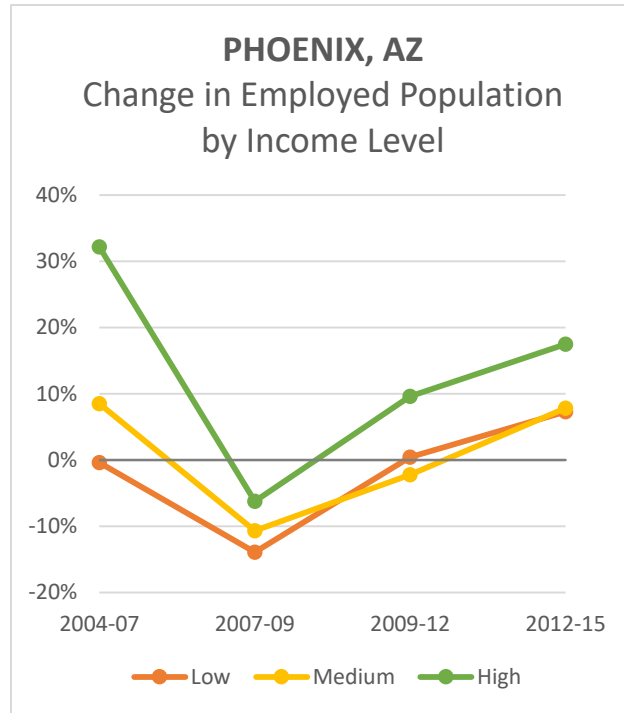


Change in medium income
employed residents, 2007-2009

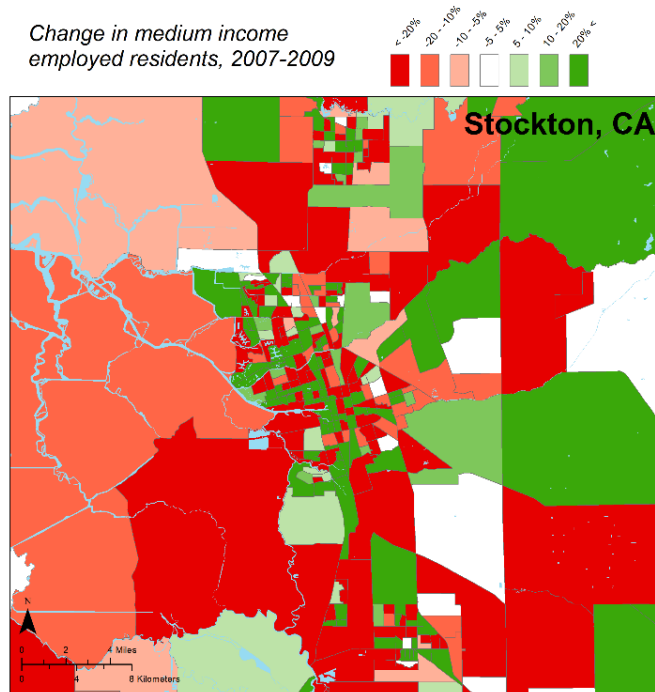


Change in high income
employed residents, 2007-2009

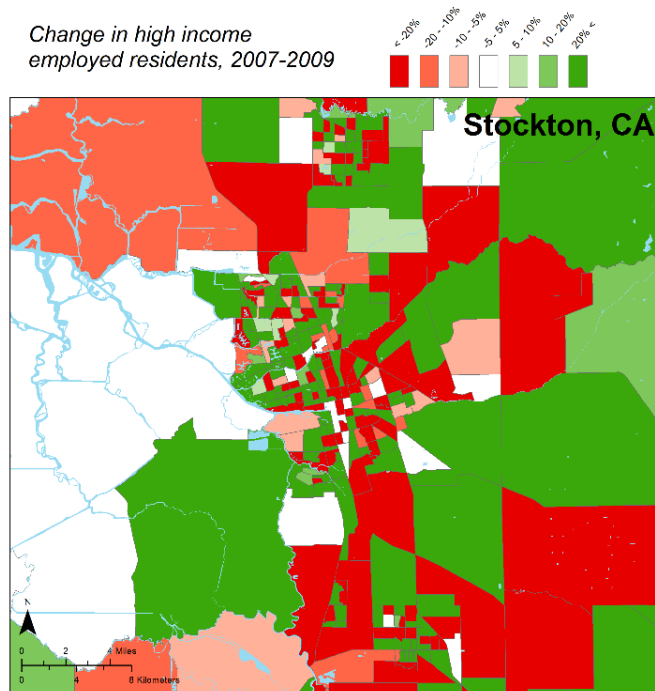


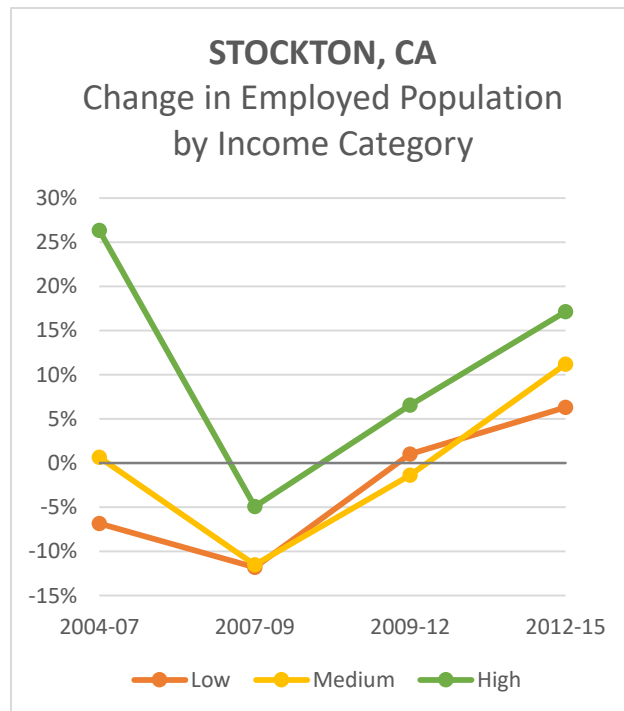
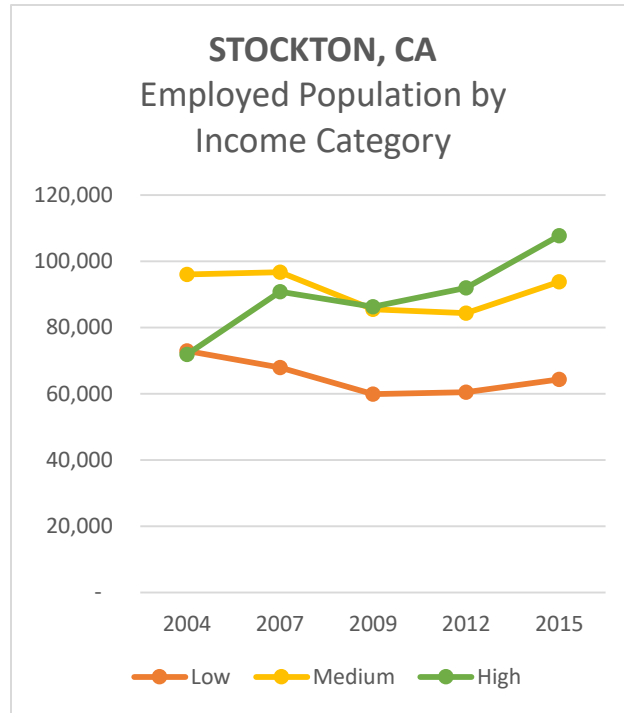


Change in medium income
employed residents, 2007-2009



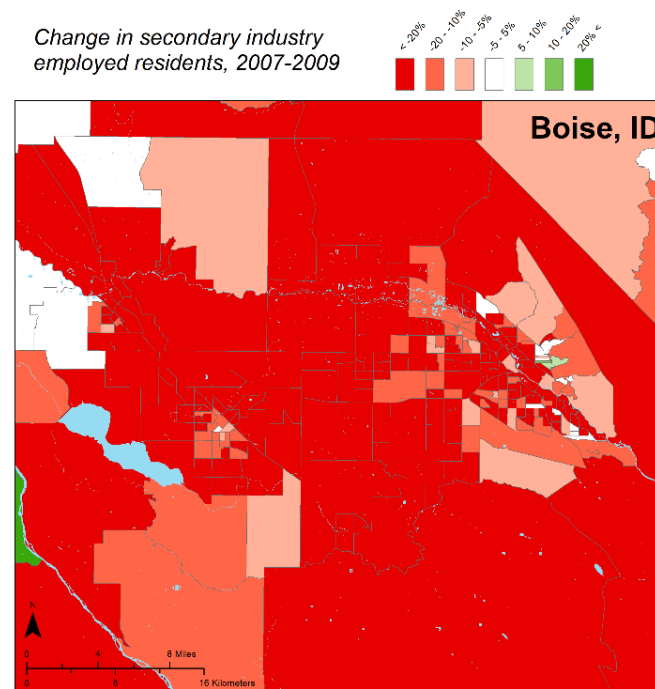
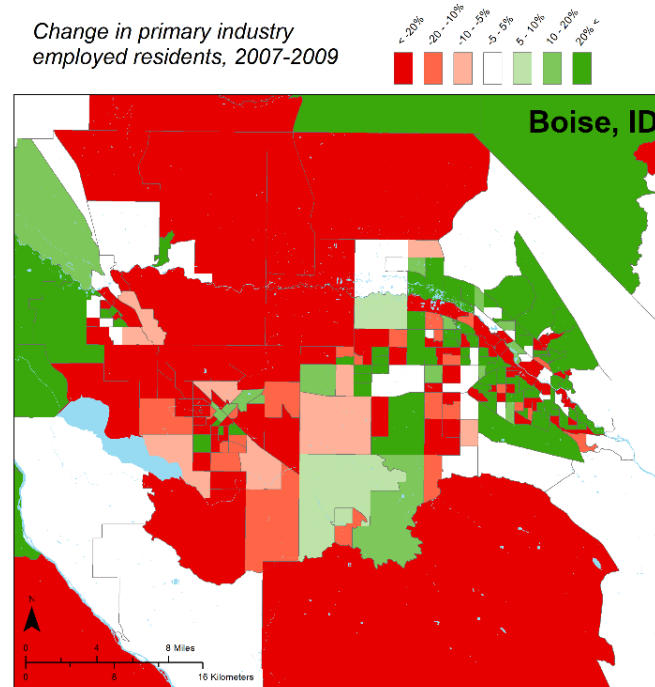
Change in high income
employed residents, 2007-2009



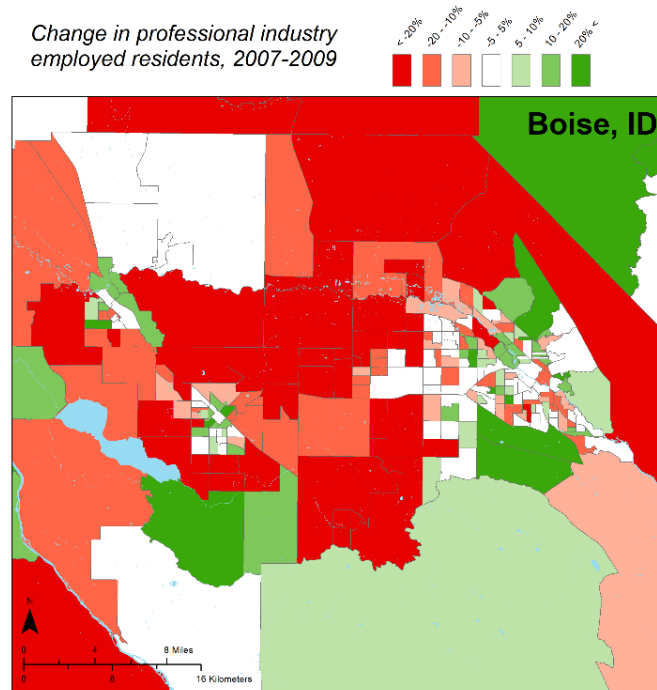


APPENDIX E

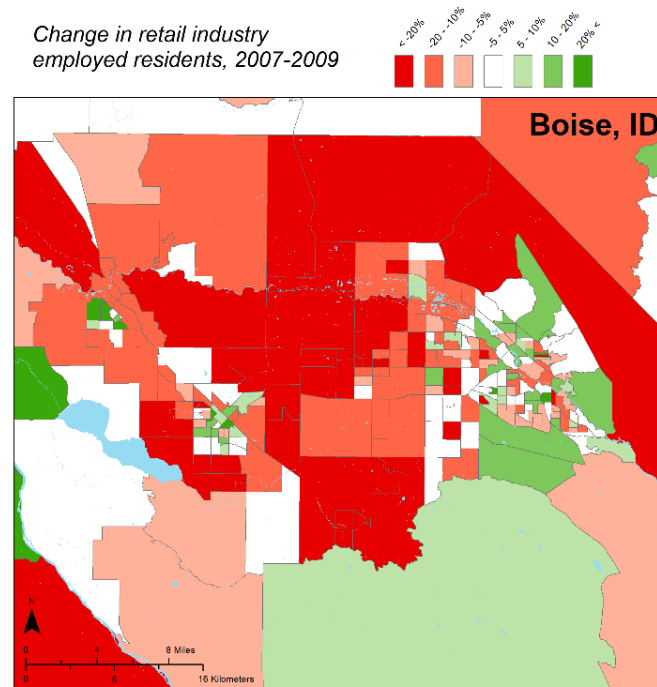
Maps and charts of change in employed residents by industry



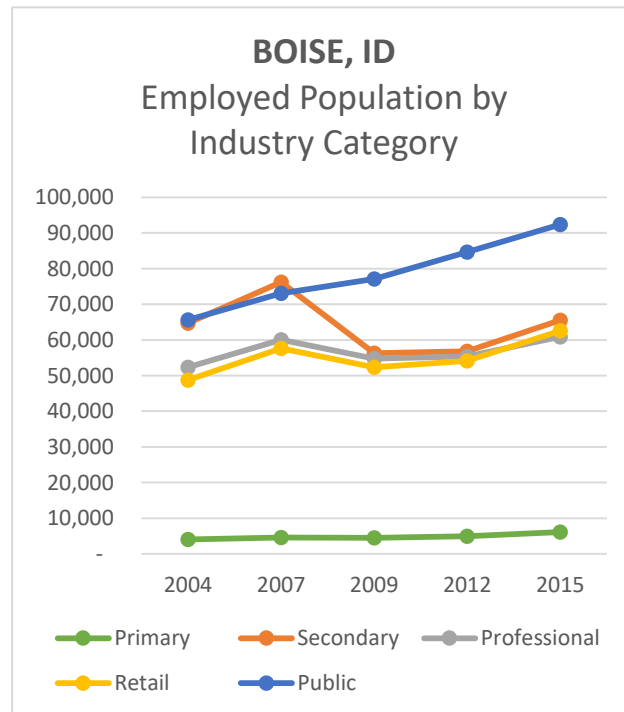
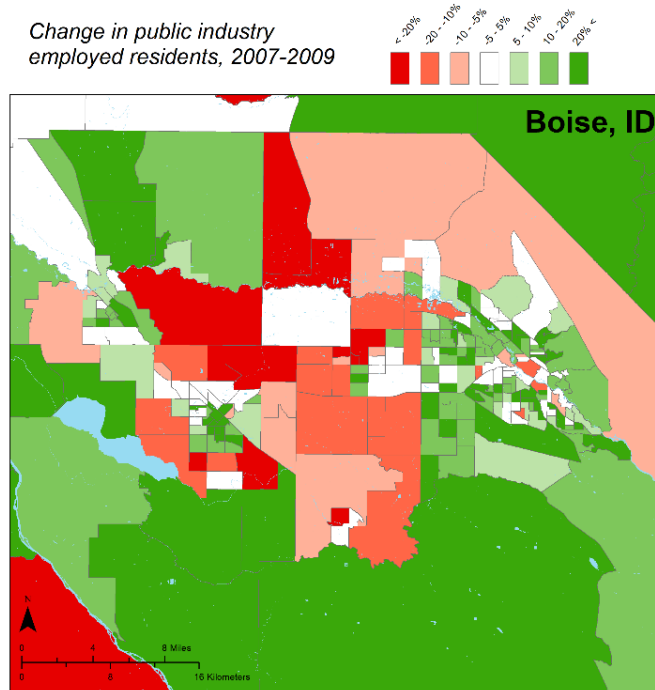
Change in professional industry
employed residents, 2007-2009

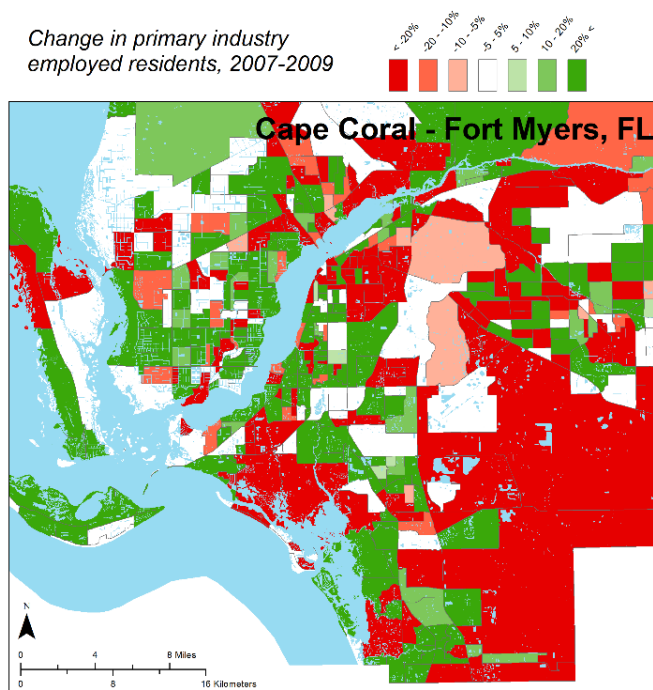
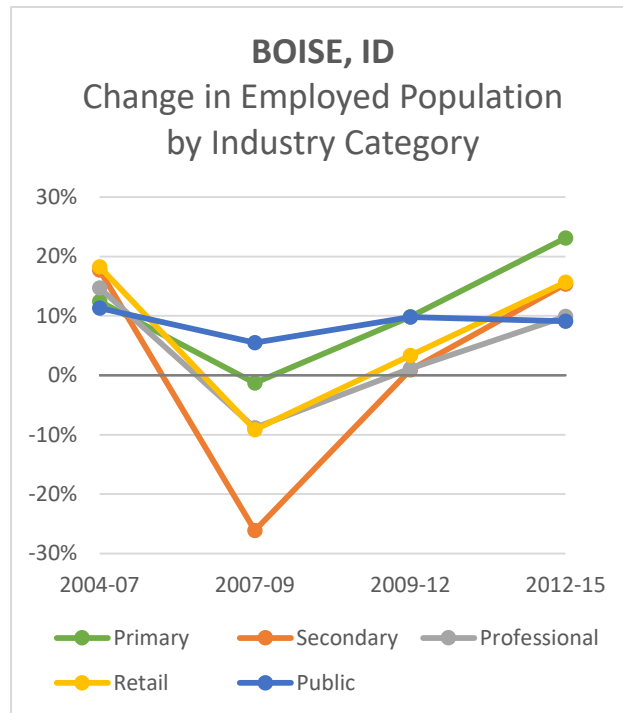


Change in retail industry
employed residents, 2007-2009

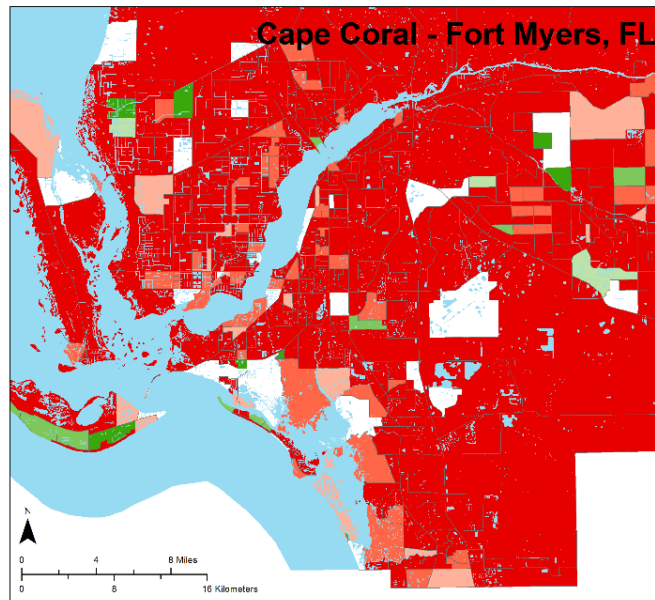
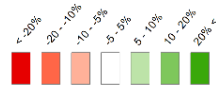


Change in public industry
employed residents, 2007-2009

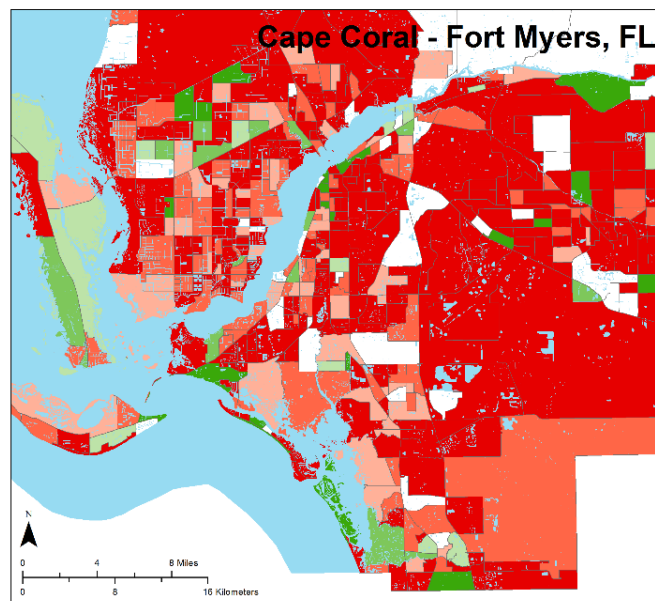
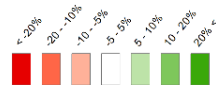




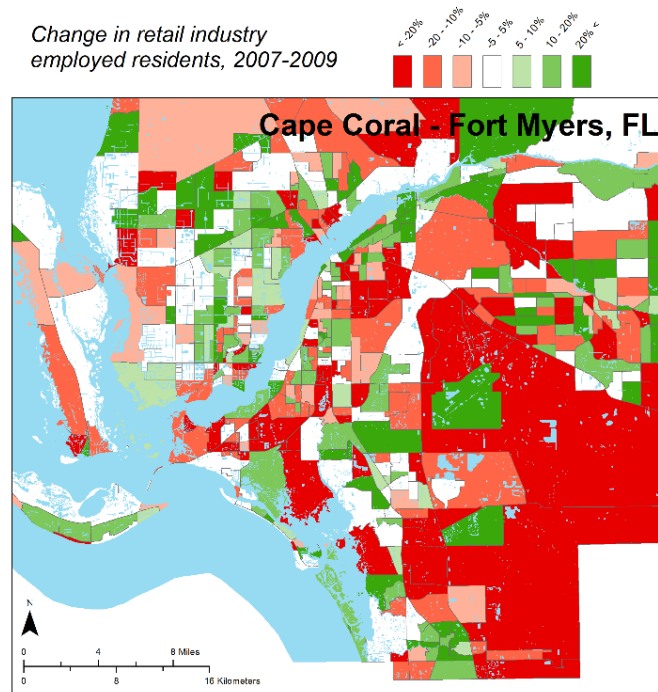
Change in secondary industry
employed residents, 2007-2009



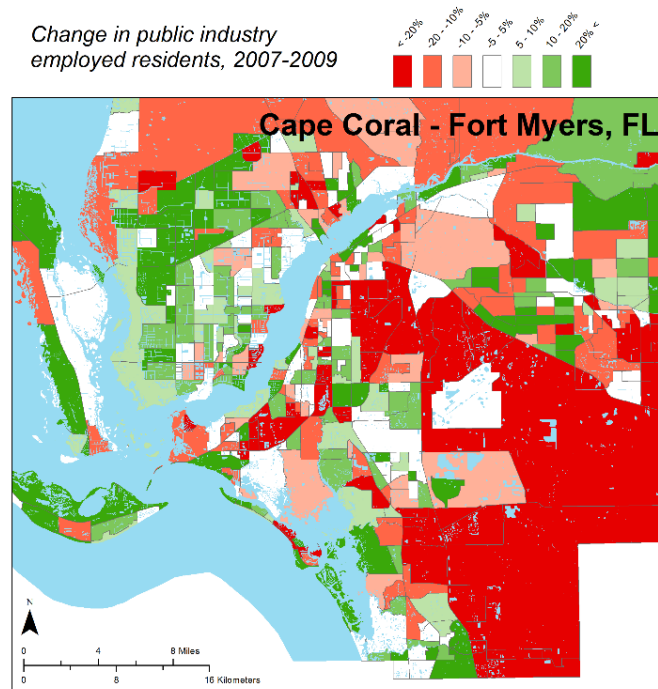
Change in professional industry
employed residents, 2007-2009

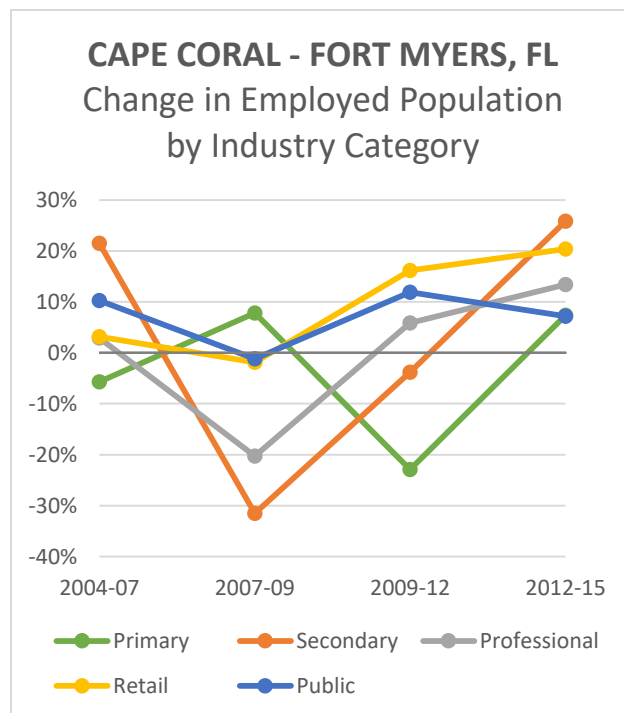
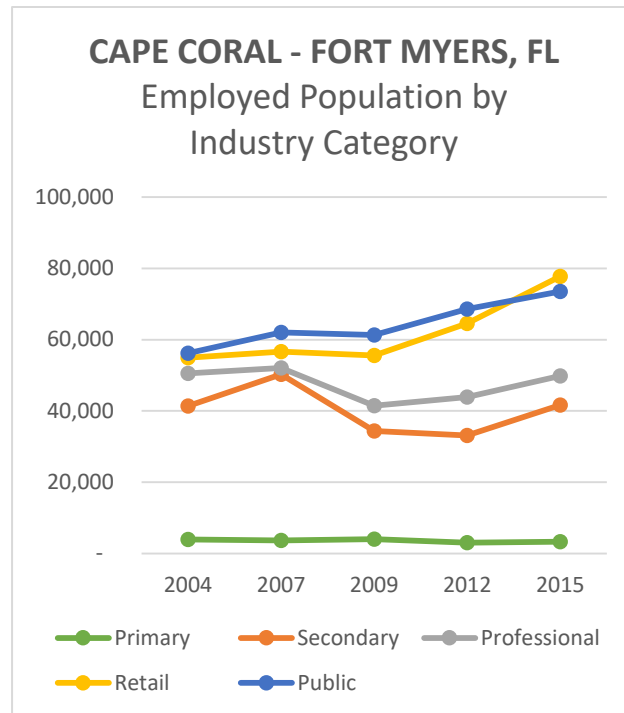


Change in retail industry
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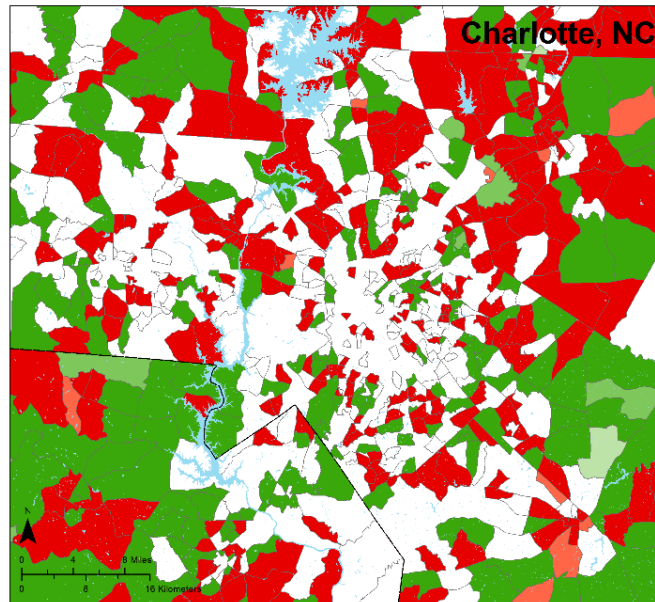
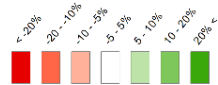


Change in public industry
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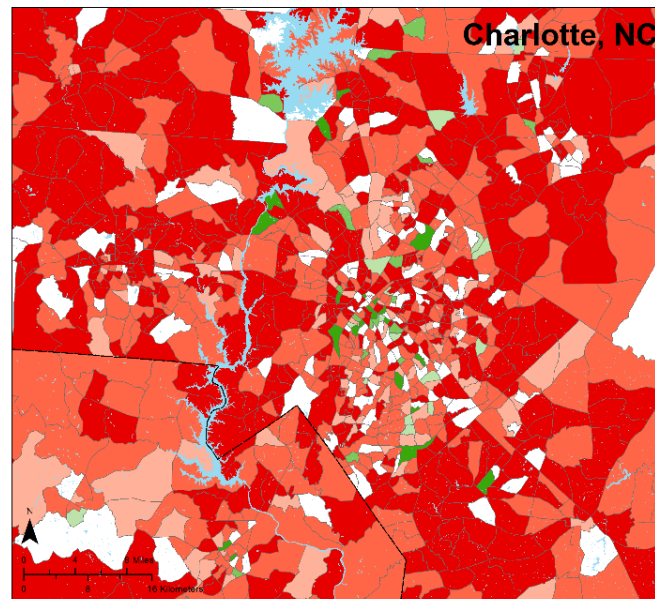
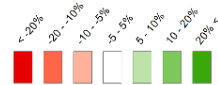




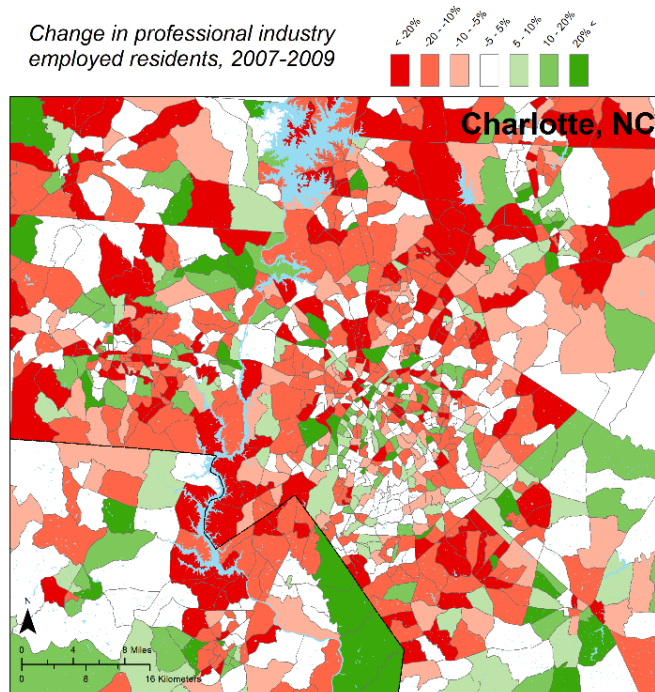
Change in primary industry
employed residents, 2007-2009



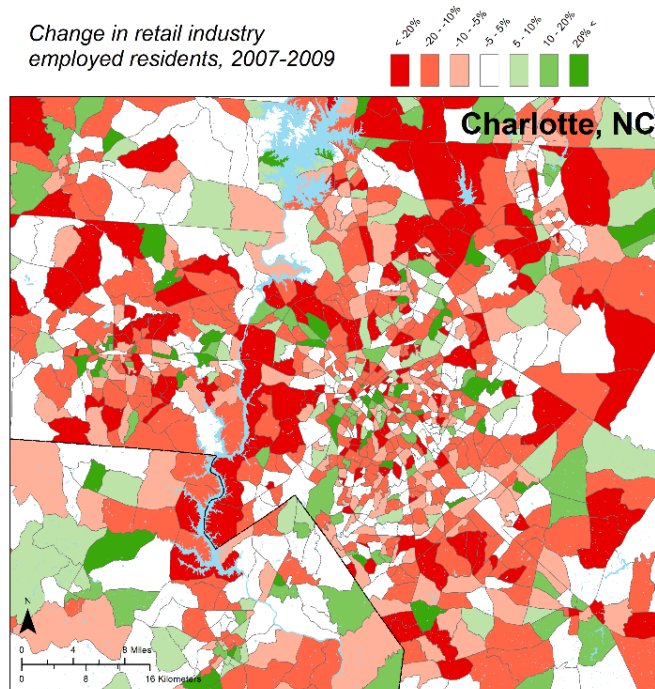
Change in secondary industry
employed residents, 2007-2009



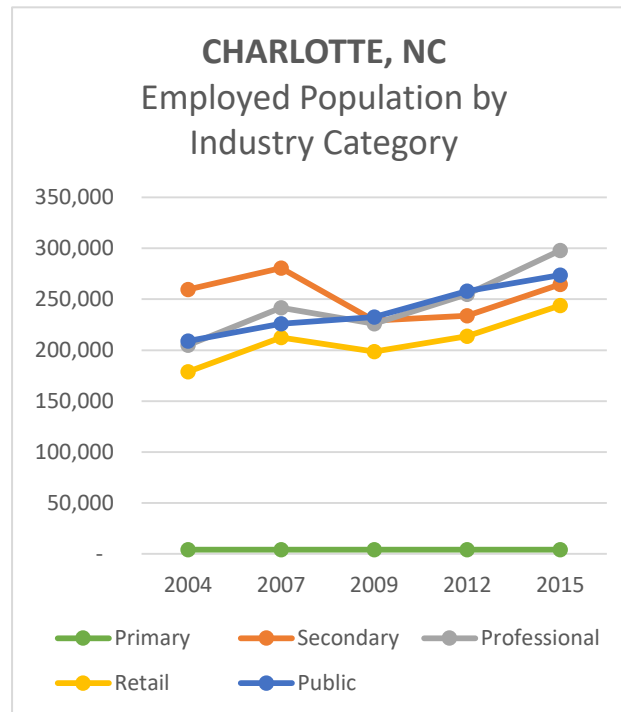
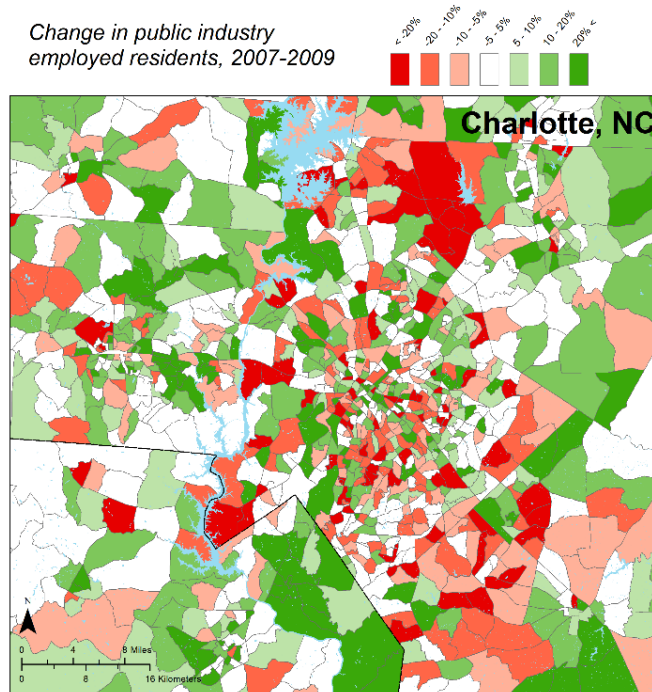
Change in professional industry
employed residents, 2007-2009

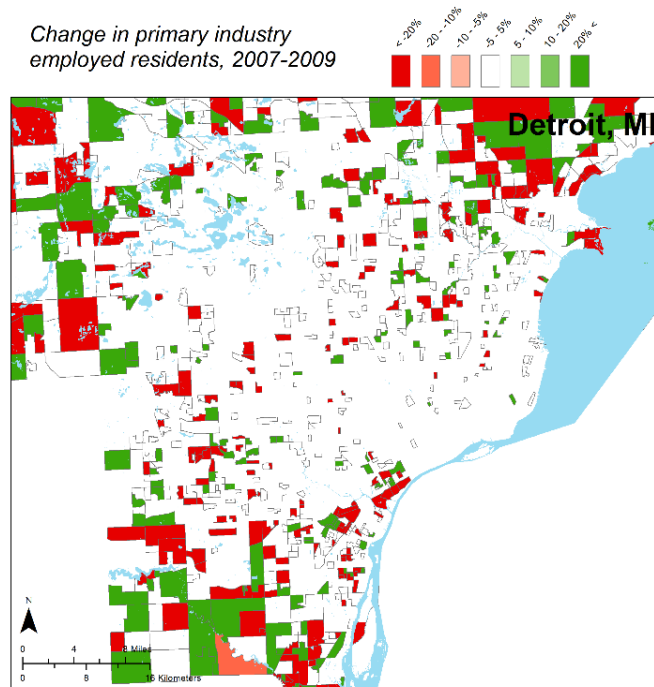
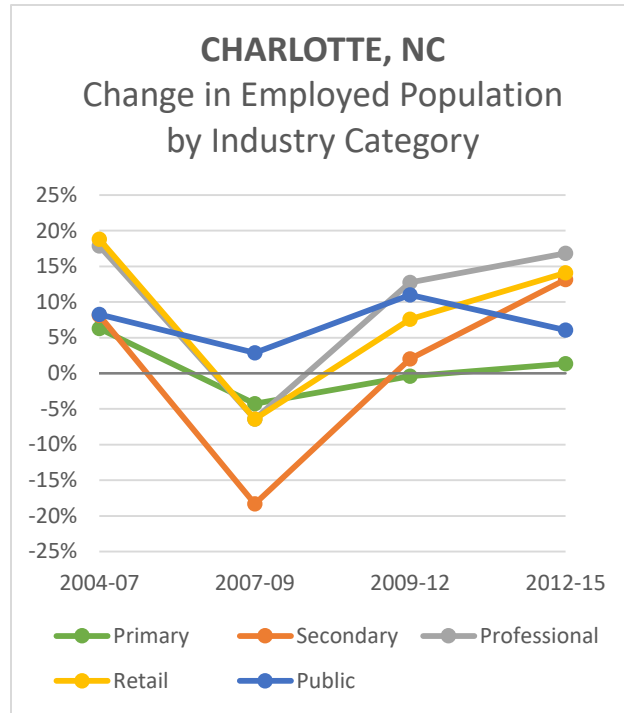


Change in retail industry
employed residents, 2007-2009

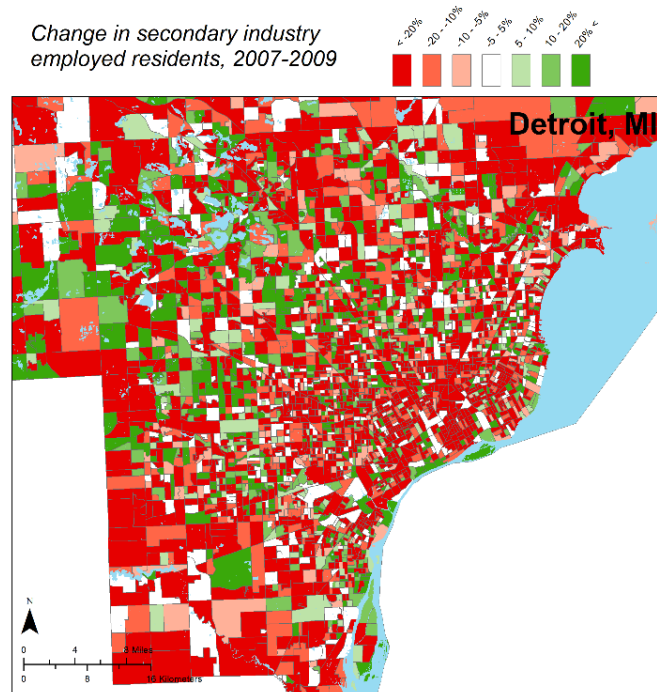


Change in public industry
employed residents, 2007-2009

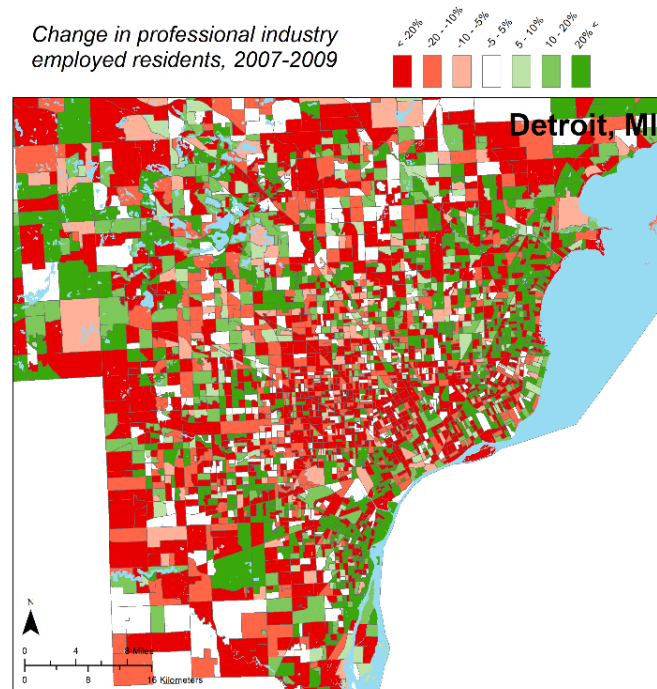




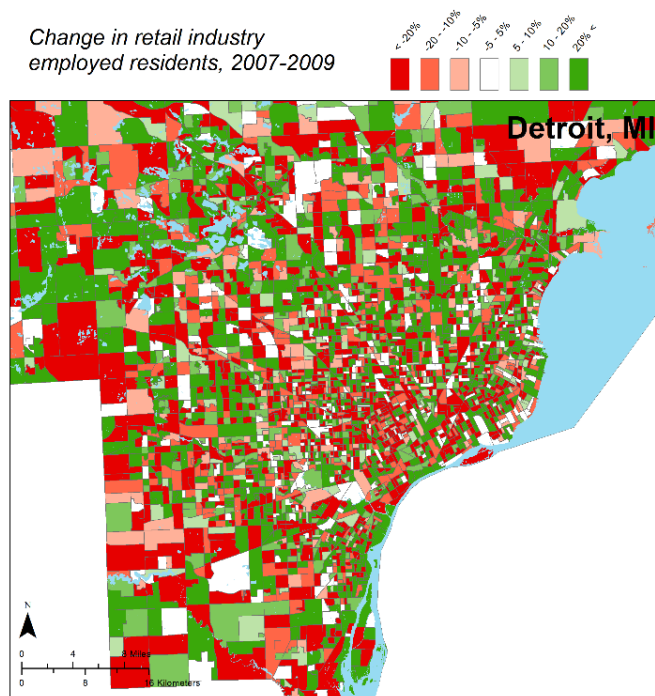
Change in secondary industry
employed residents, 2007-2009



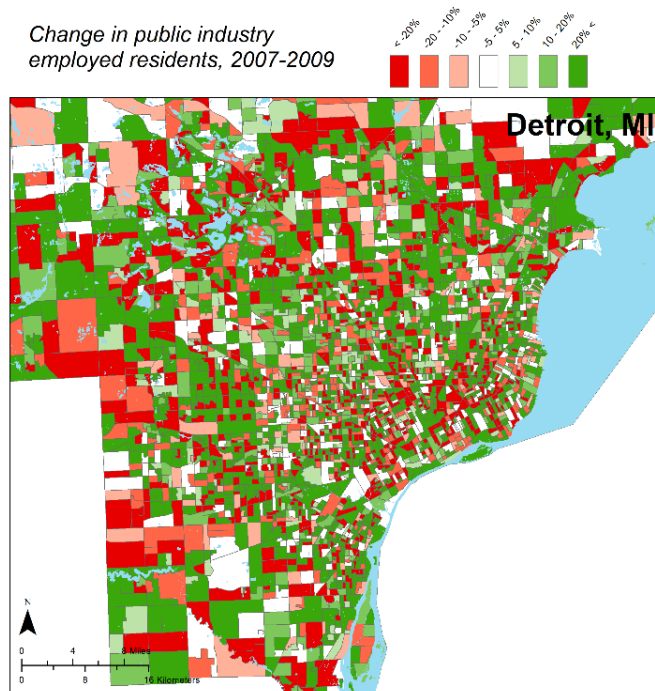
Change in professional industry
employed residents, 2007-2009

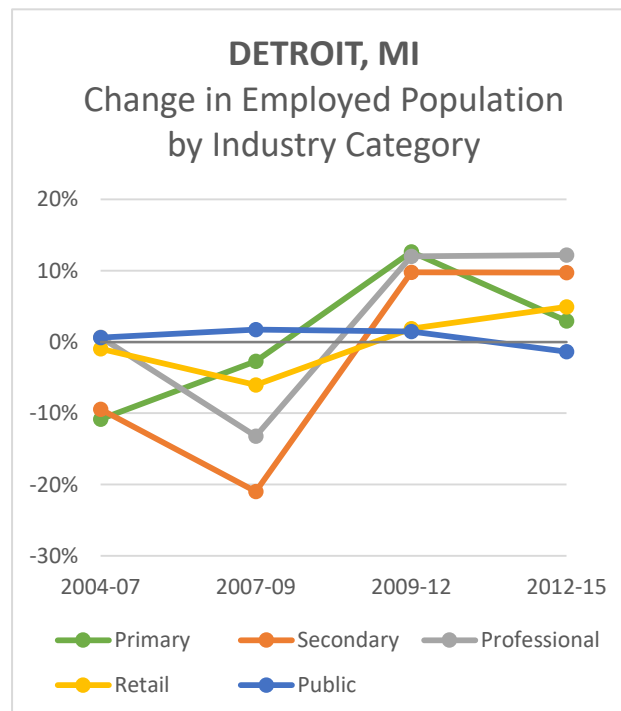
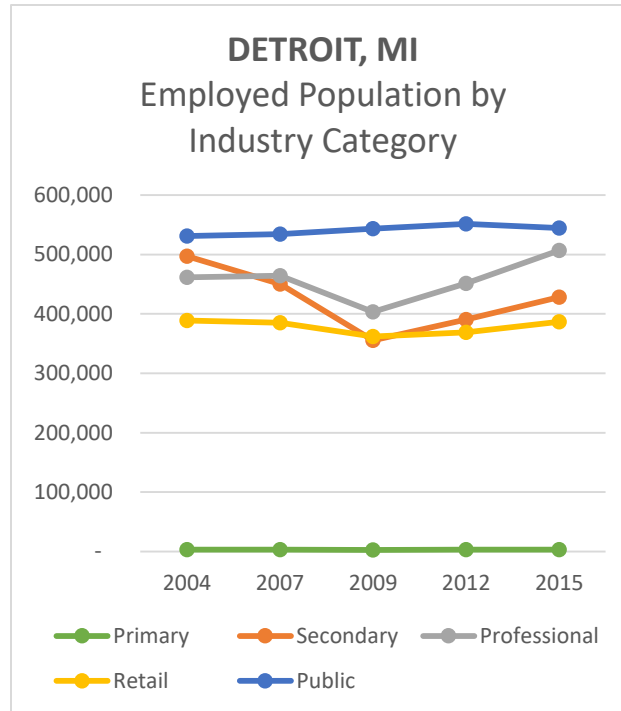


Change in retail industry
employed residents, 2007-2009

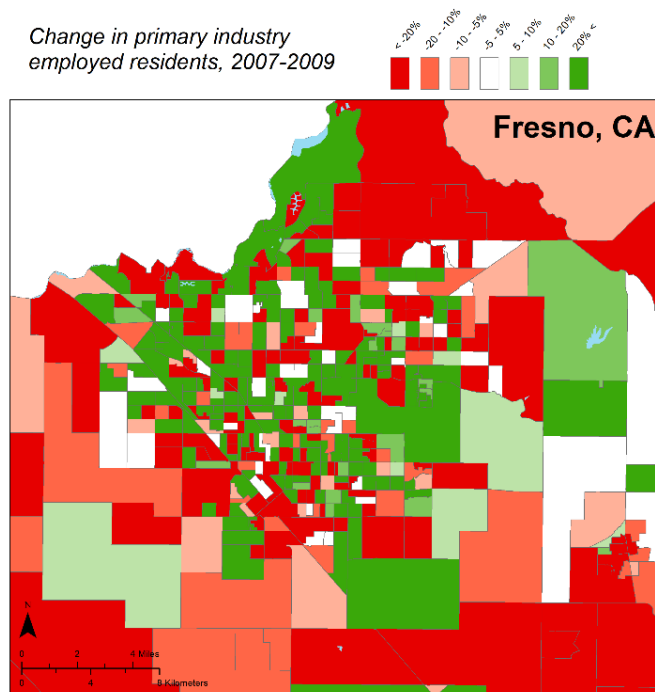


Change in public industry
employed residents, 2007-2009

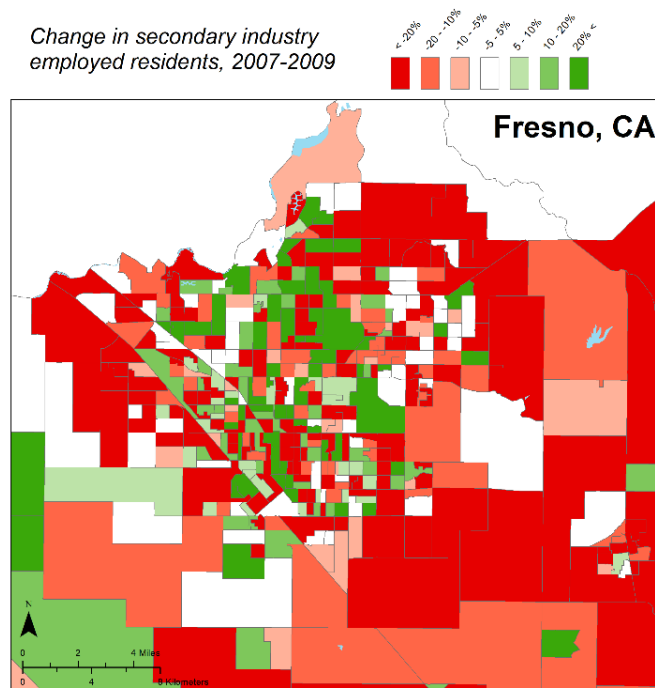




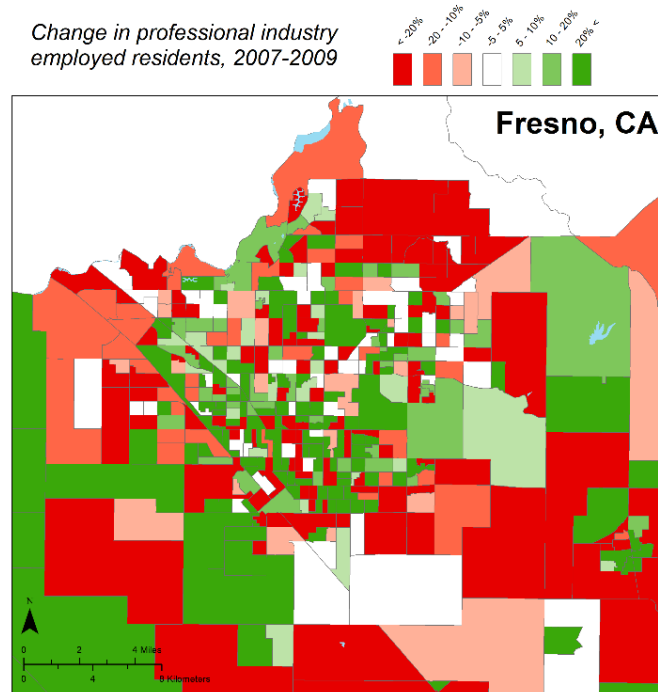
Change in primary industry
employed residents, 2007-2009



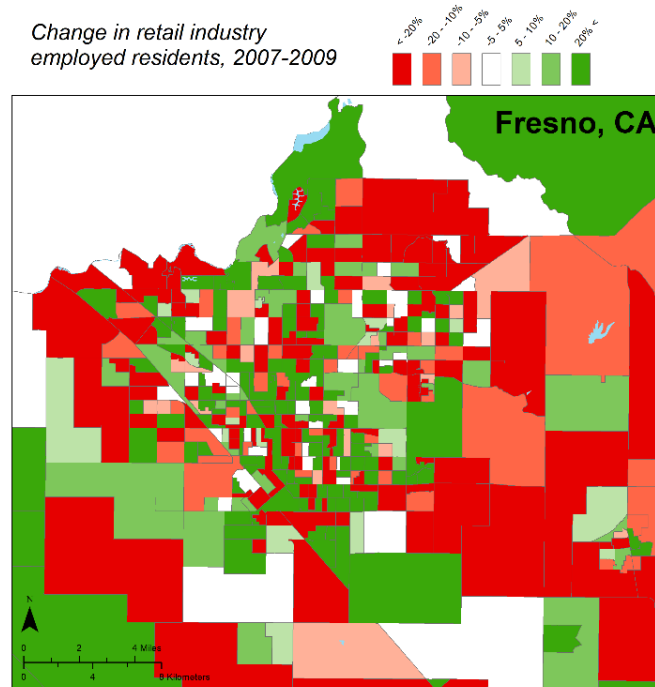
Change in secondary industry
employed residents, 2007-2009



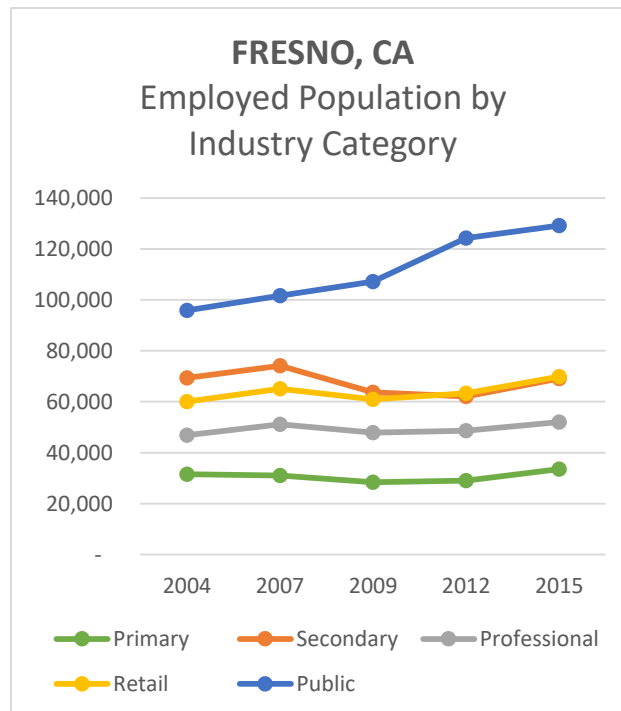
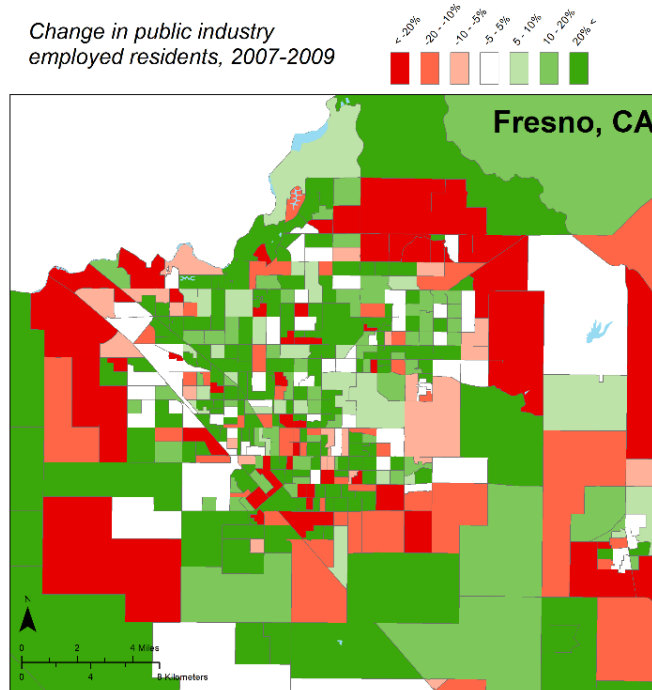
Change in professional industry
employed residents, 2007-2009

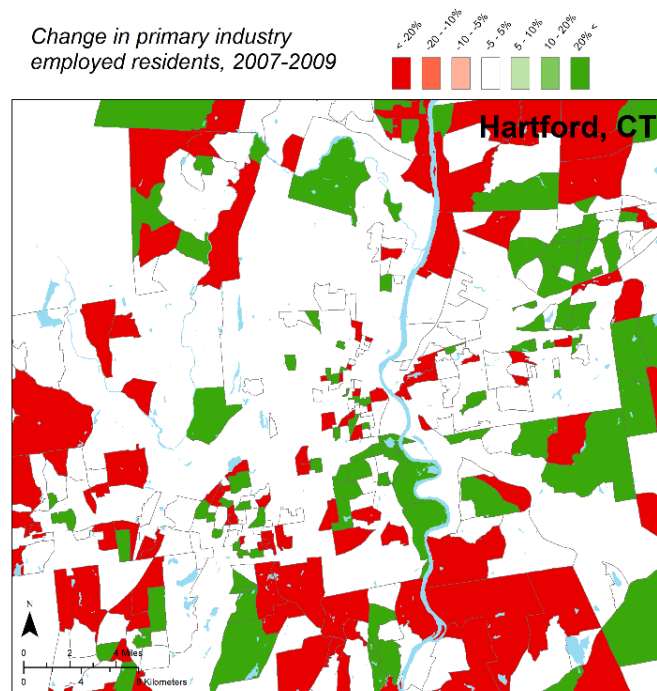
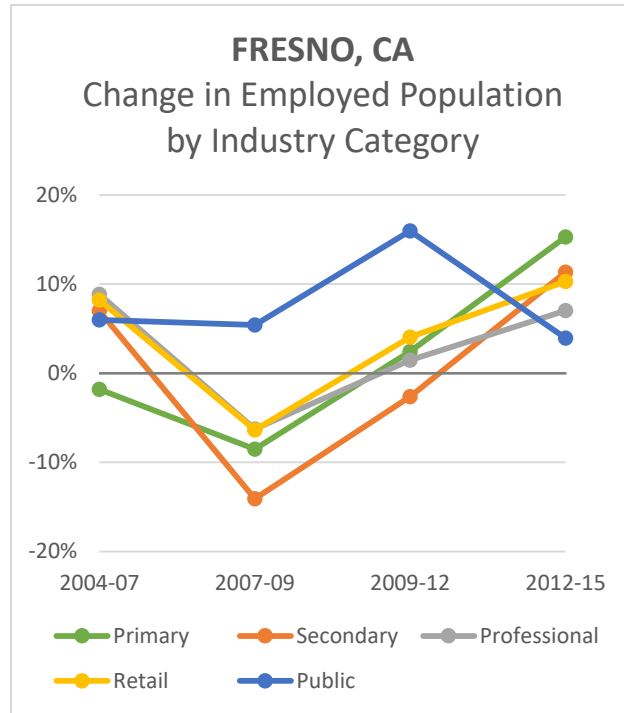


Change in retail industry
employed residents, 2007-2009

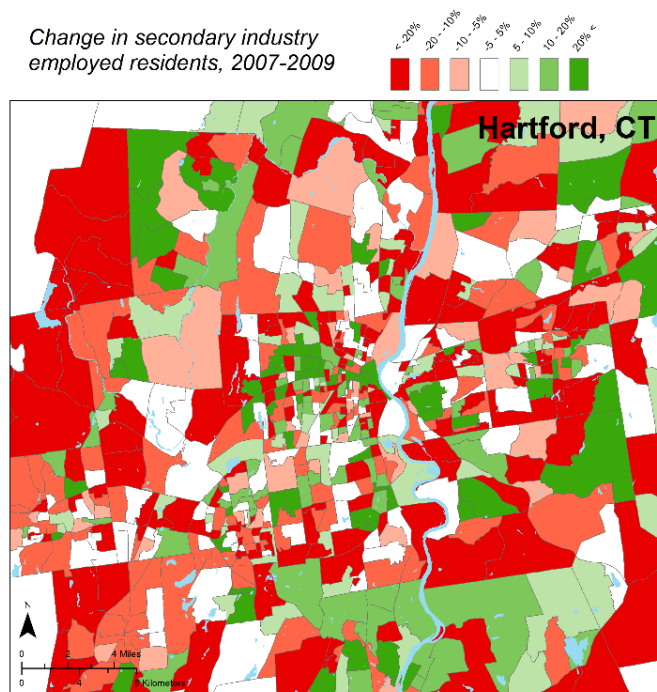


Change in public industry
employed residents, 2007-2009

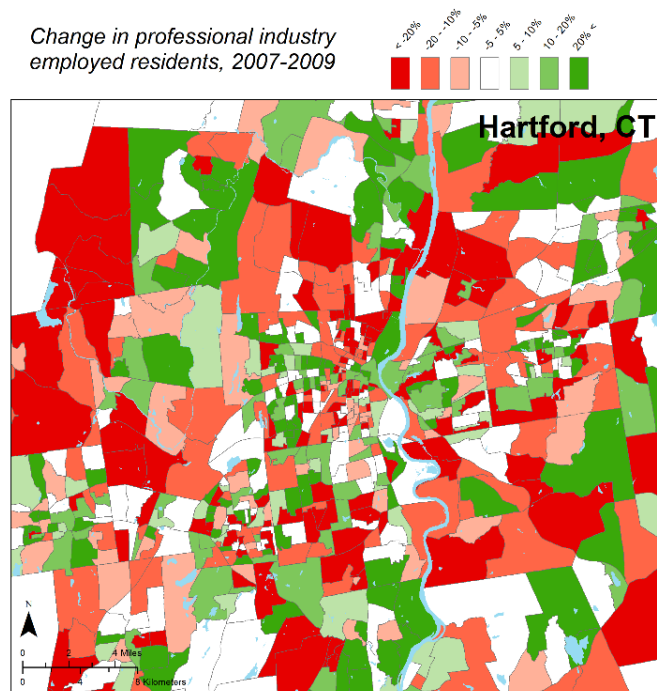




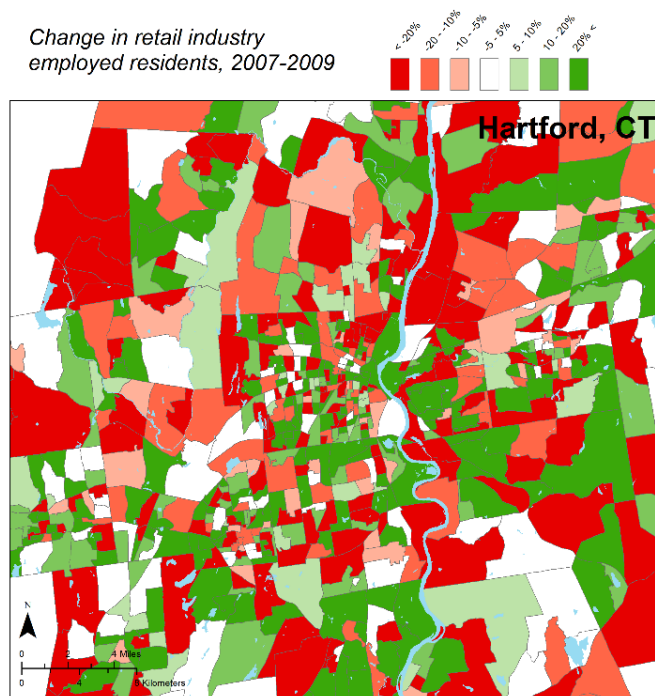
Change in secondary industry
employed residents, 2007-2009



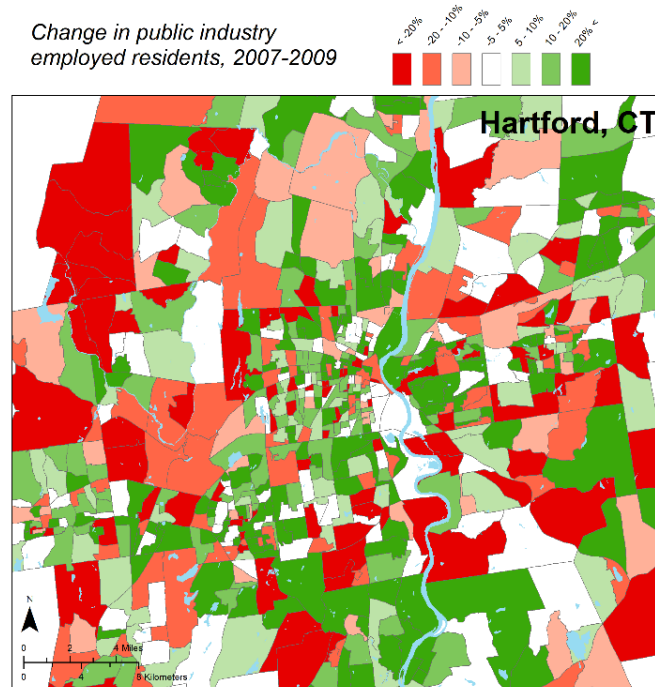
Change in professional industry
employed residents, 2007-2009

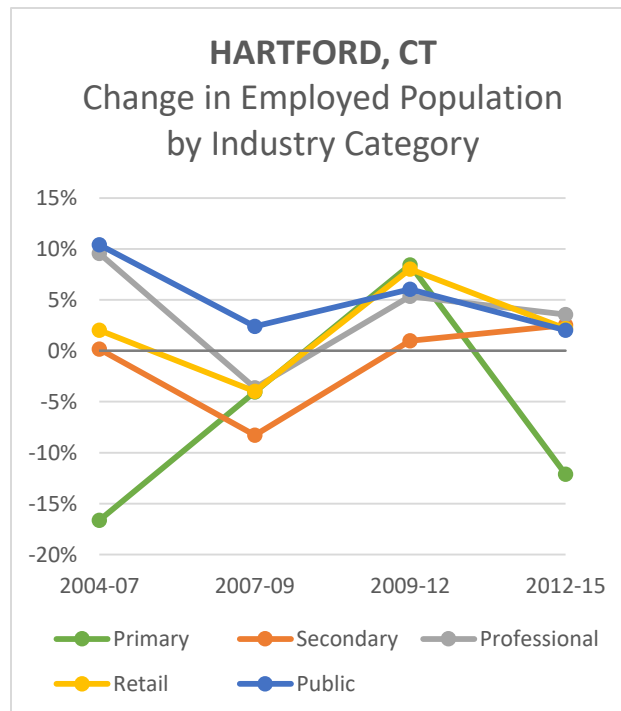
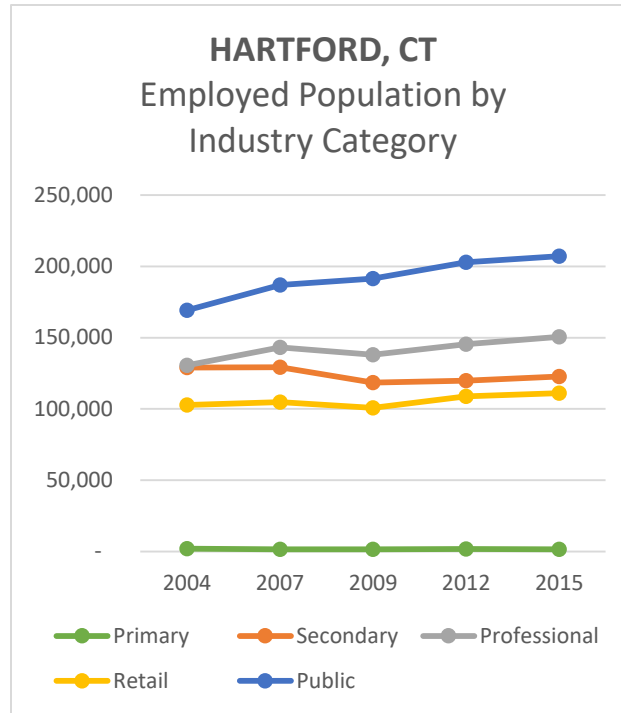


Change in retail industry
employed residents, 2007-2009

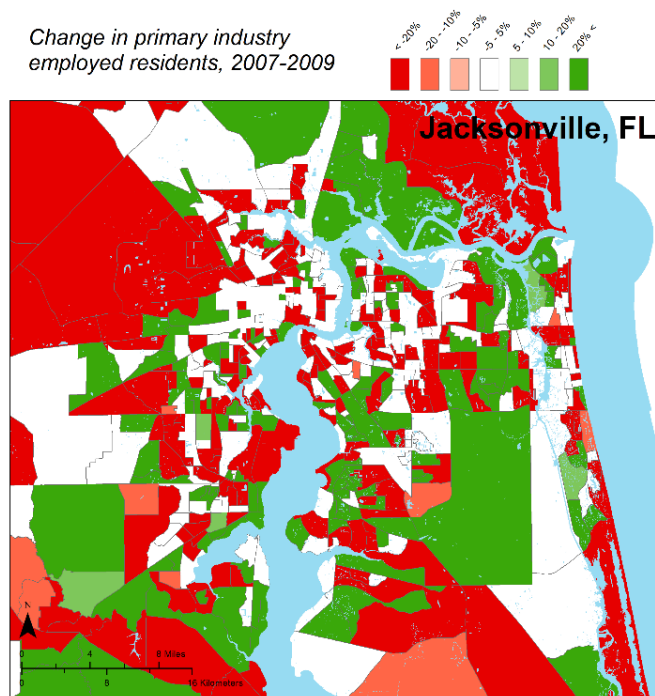


Change in public industry
employed residents, 2007-2009

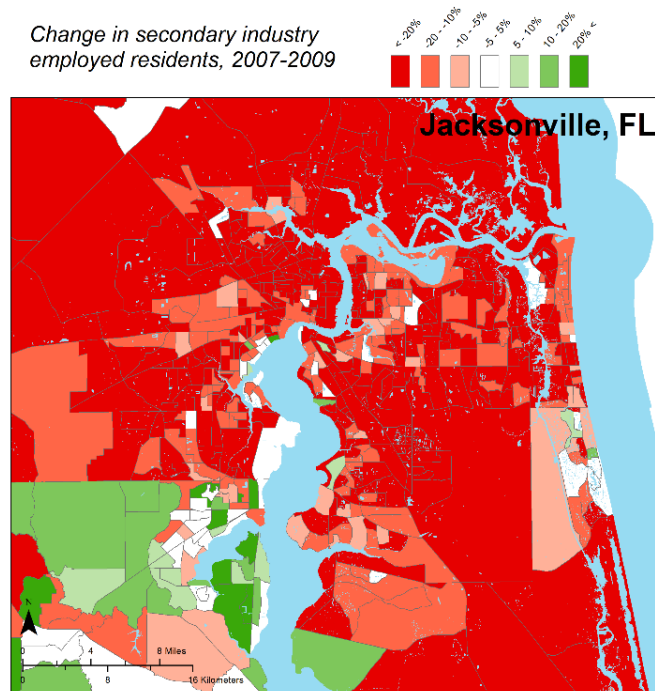




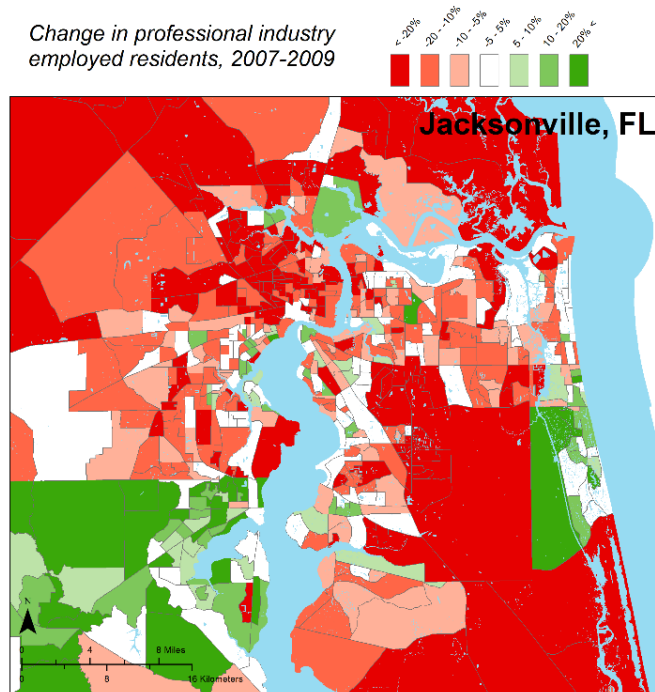
Change in primary industry
employed residents, 2007-2009



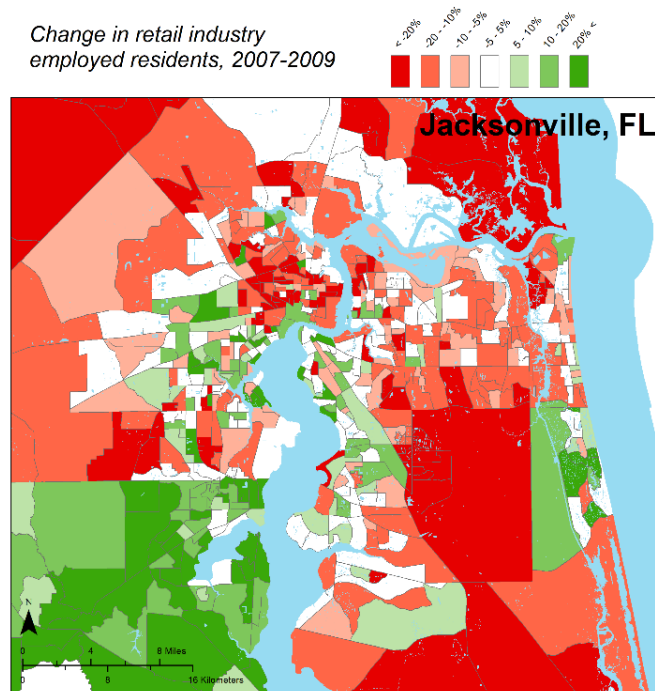
Change in secondary industry
employed residents, 2007-2009



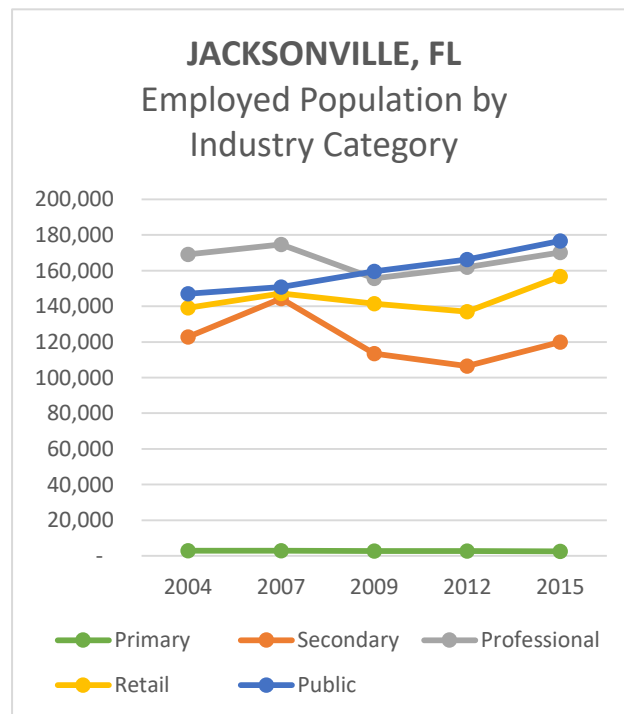
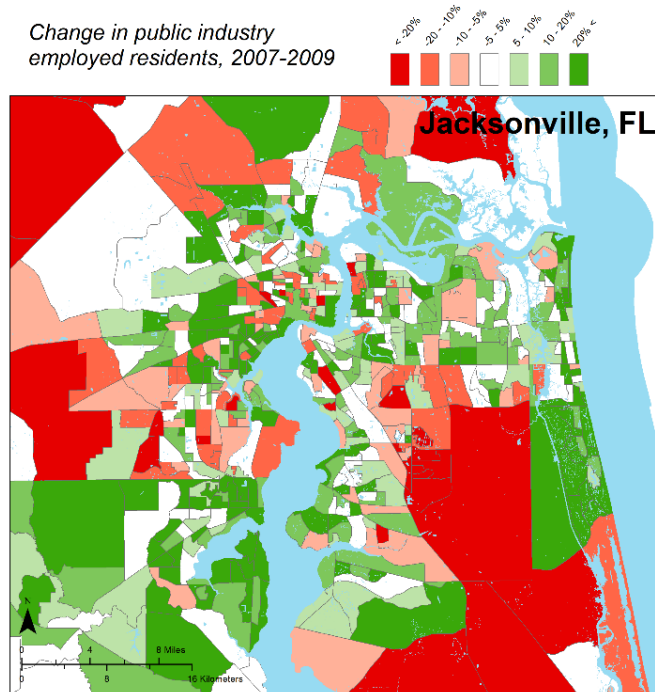
Change in professional industry
employed residents, 2007-2009

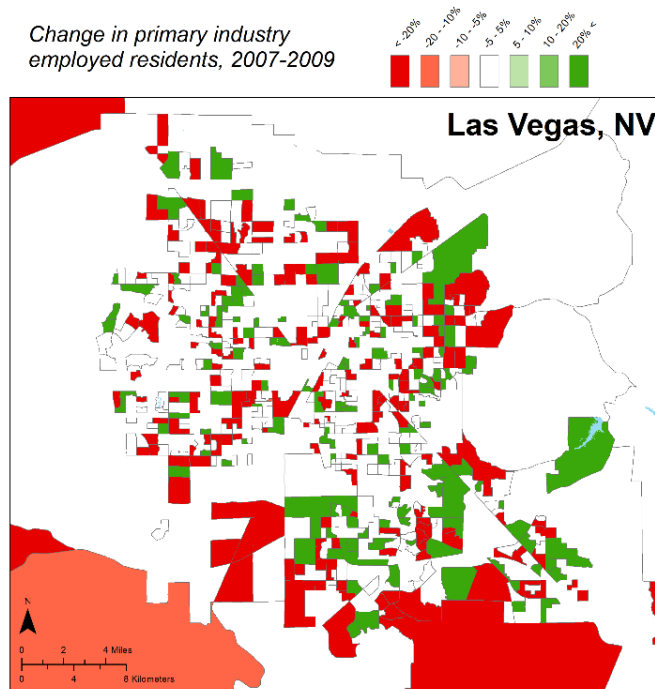
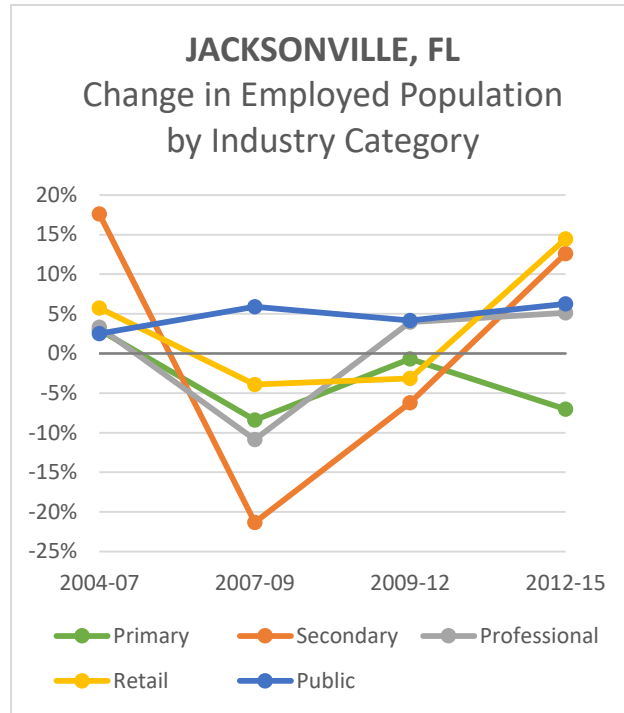


Change in retail industry
employed residents, 2007-2009

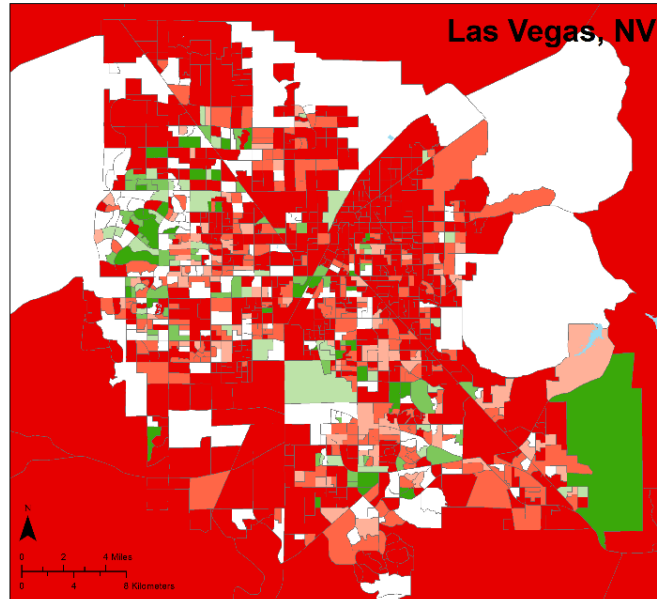
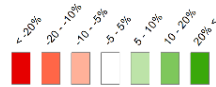


Change in public industry
employed residents, 2007-2009

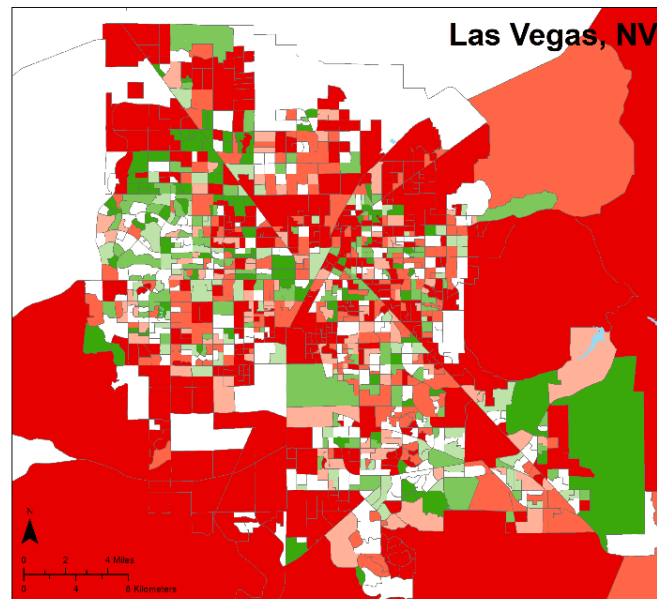
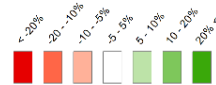




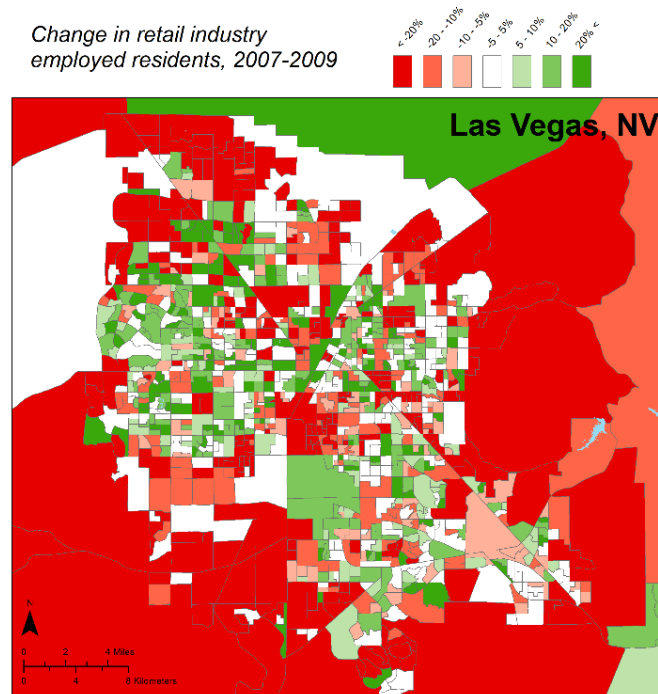
Change in secondary industry
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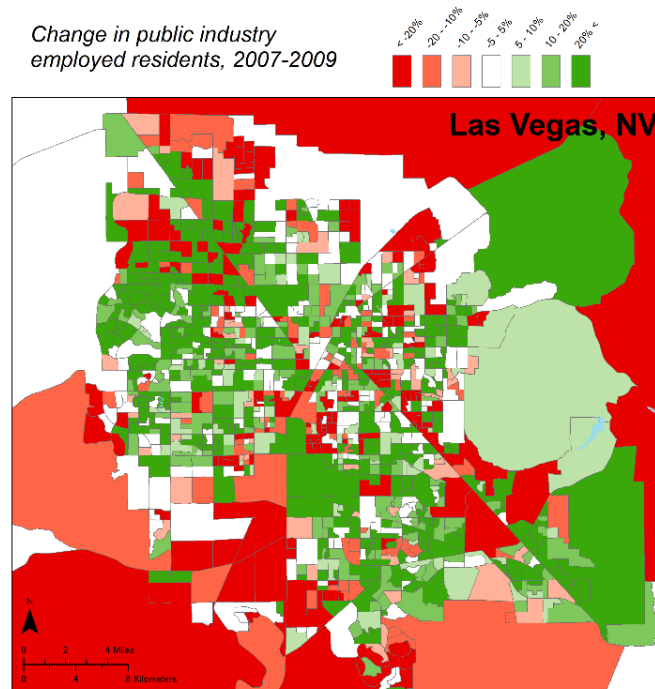
Change in professional industry
employed residents, 2007-2009

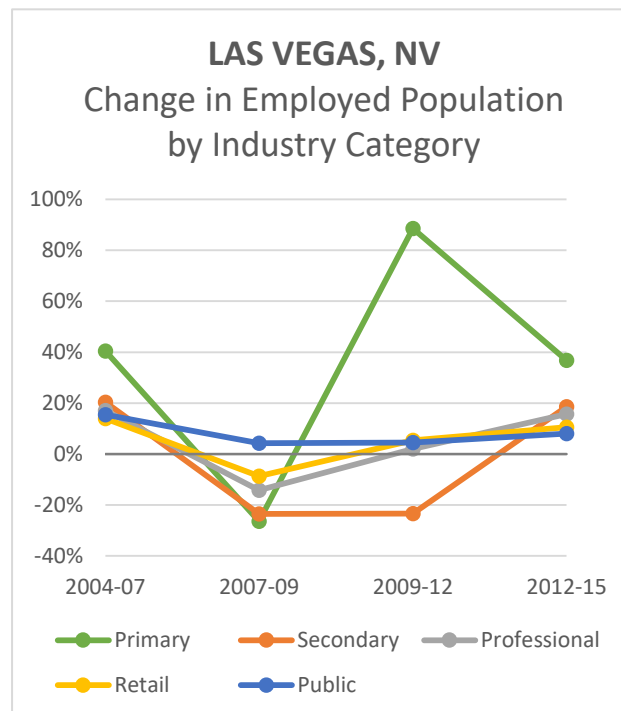
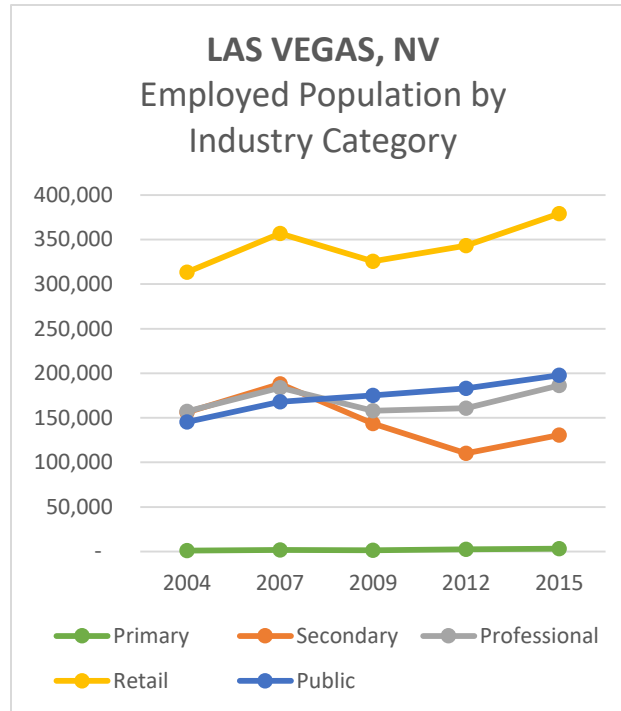


Change in retail industry
employed residents, 2007-2009

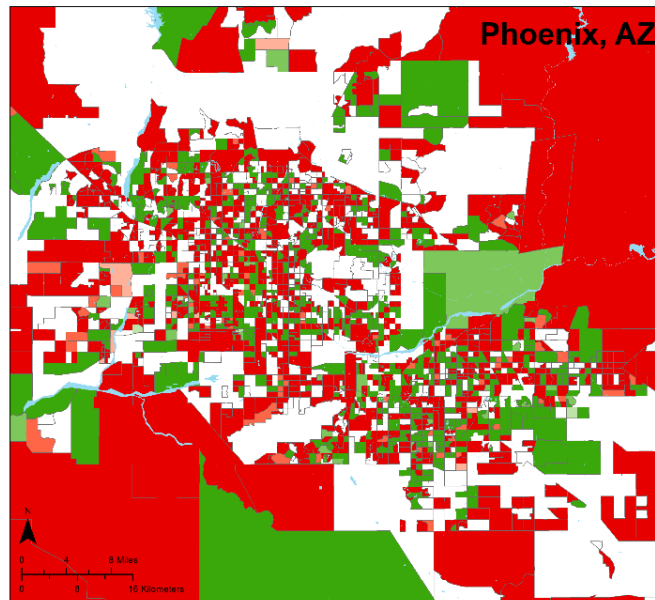
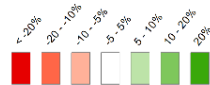


Change in public industry
employed residents, 2007-2009

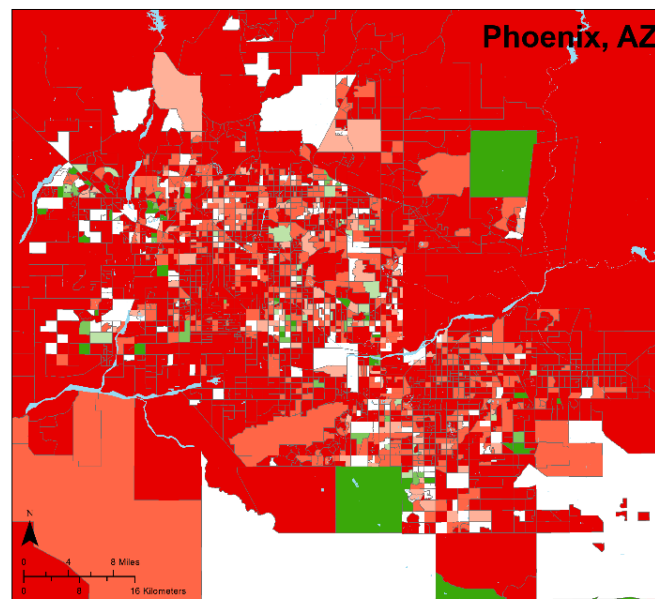
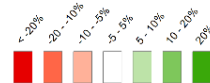




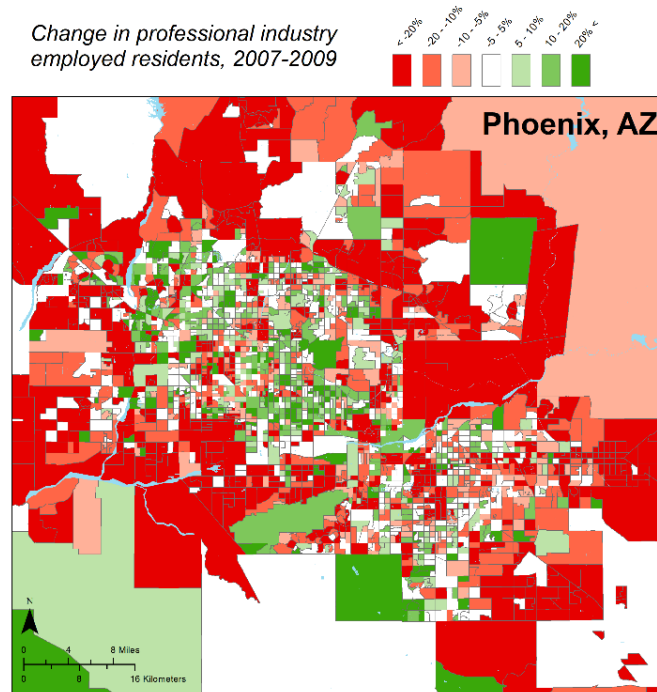
Change in primary industry
employed residents, 2007-2009



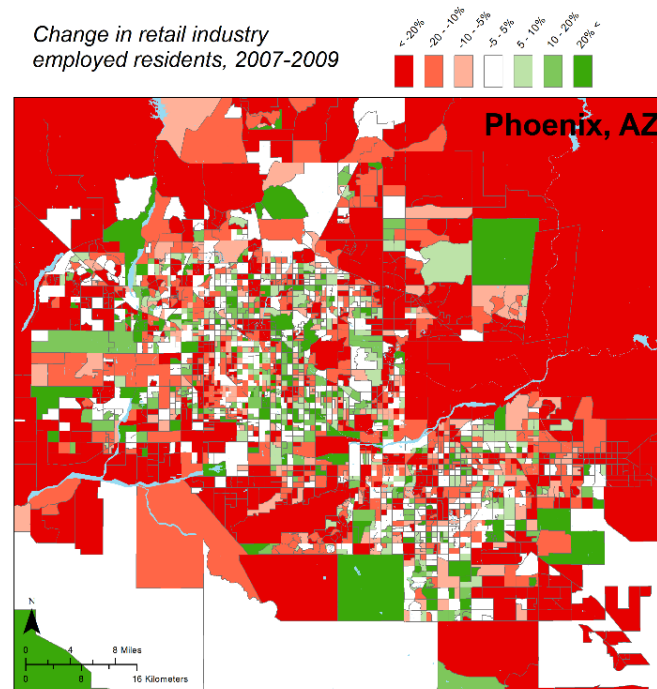
Change in secondary industry
employed residents, 2007-2009



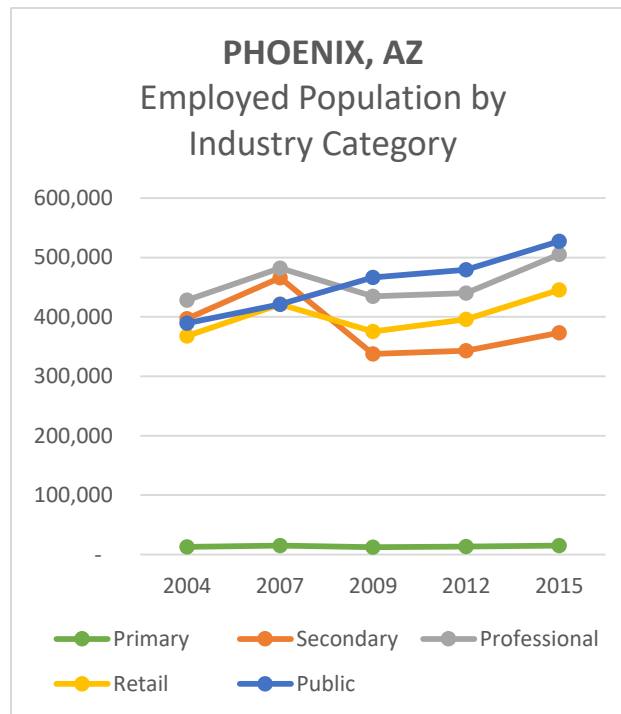
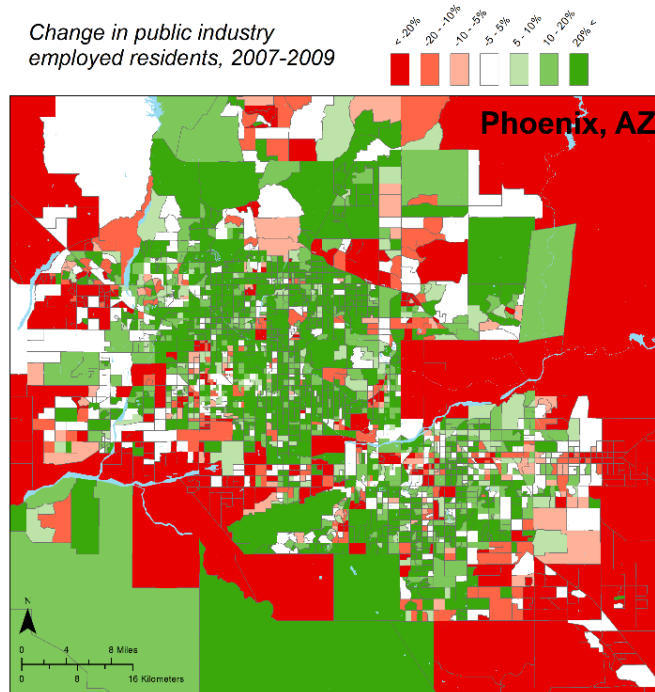
Change in professional industry
employed residents, 2007-2009

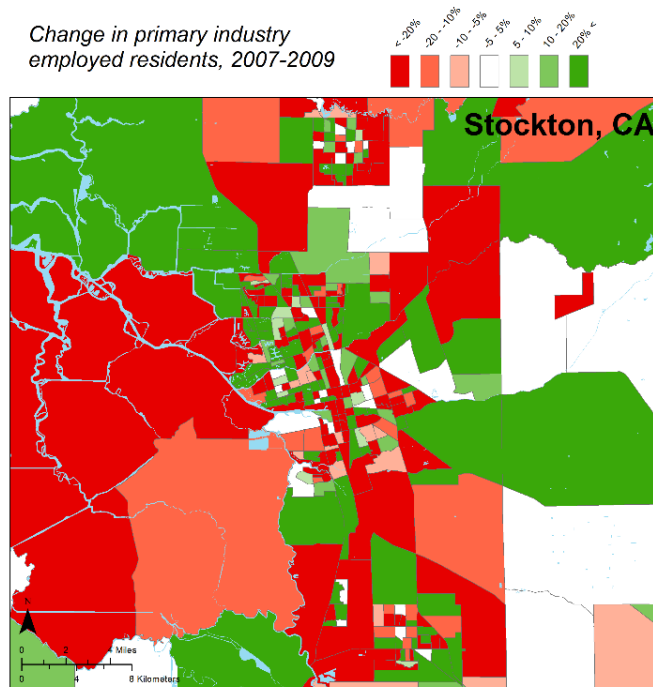
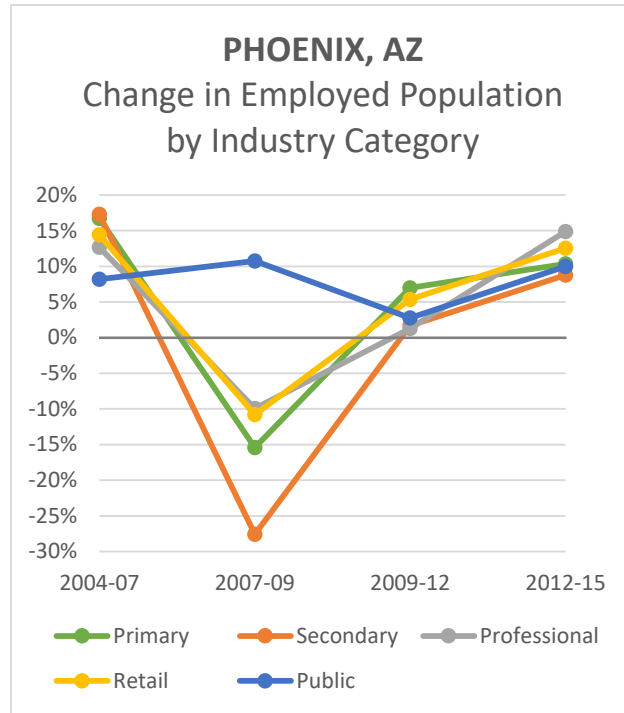


Change in retail industry
employed residents, 2007-2009

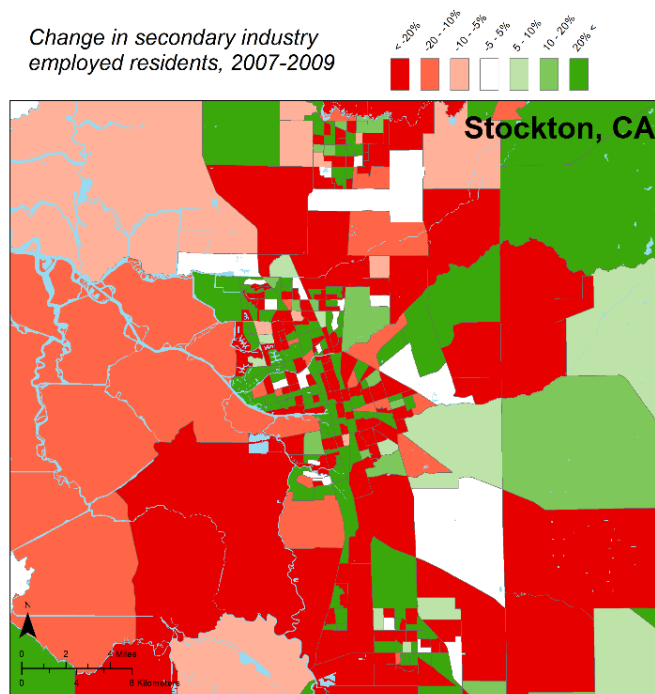


Change in public industry
employed residents, 2007-2009

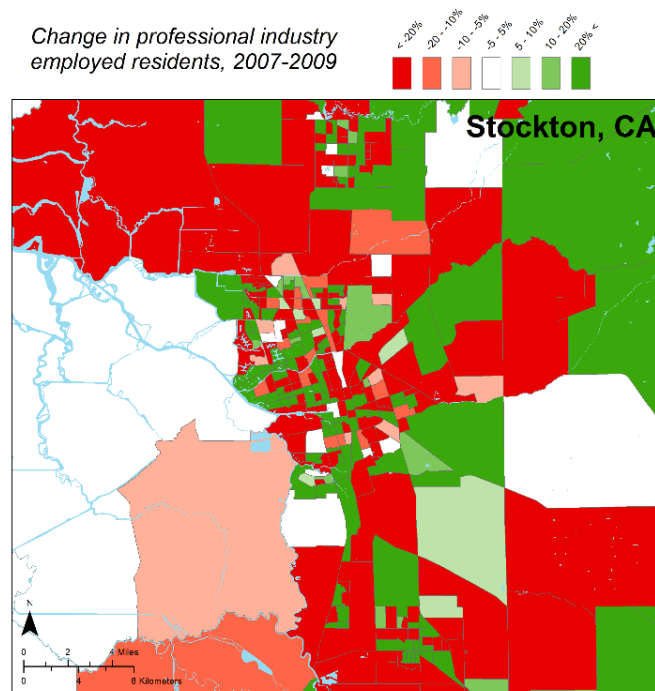




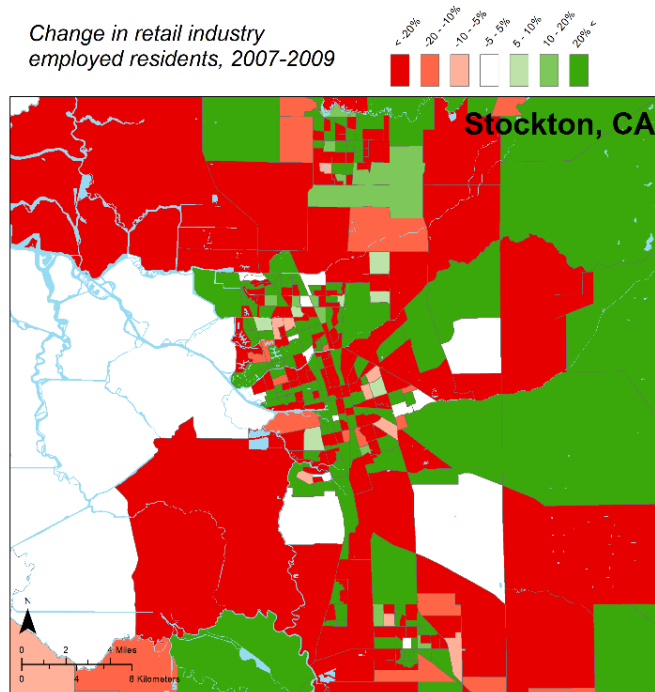
Change in secondary industry
employed residents, 2007-2009



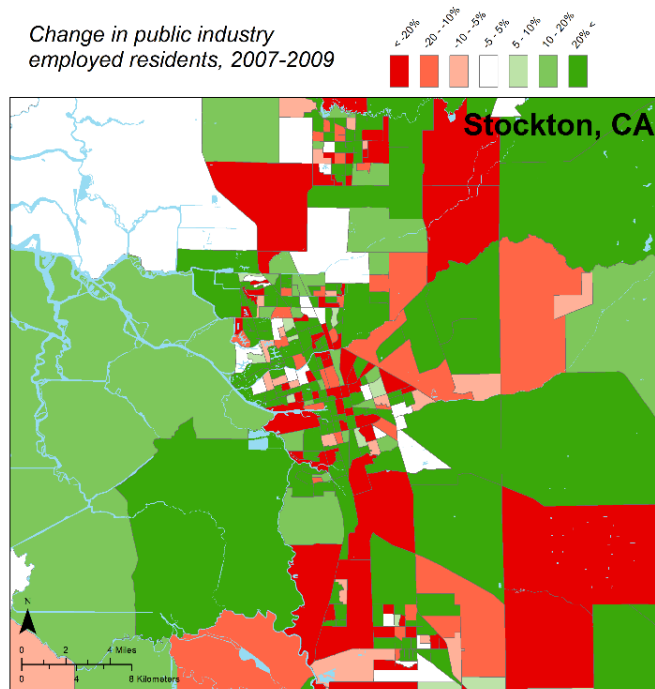
Change in professional industry
employed residents, 2007-2009

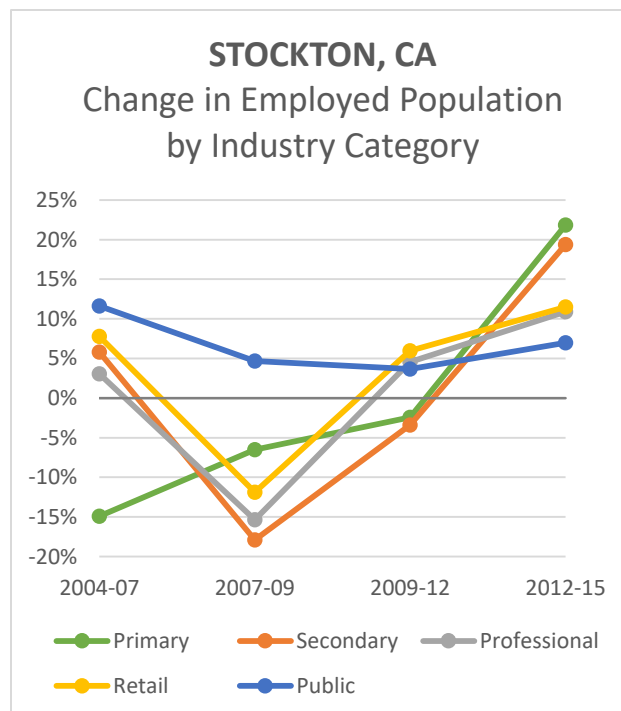
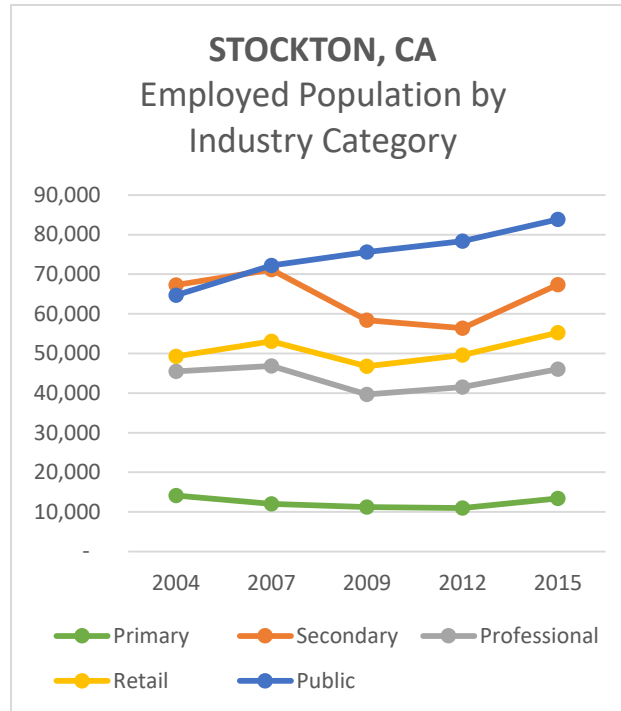


Change in retail industry
employed residents, 2007-2009



Change in public industry
employed residents, 2007-2009





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